



Paddy to Plate


THE RICE ECOSYSTEM IN MYANMAR:
CHALLENGES AND OPPORTUNITIES

MYANMAR RICE REPORT
Proximity Designs
with Studio D Radiodurans

SHWEBO,
PYAY,
DANUBYU,

NYAUNG SHWE,
YANGON,
MYANMAR.

20
16



“A comprehensive exploration of the paddy and rice ecosystem in Myanmar that will be a foundation for projects for years to come.”

– Debbie Aung Din, Co-founder, Proximity Designs

PADDY TO PLATE

**The Rice Ecosystem in Myanmar:
Challenges and Opportunities**

Our intent in preparing this study was not to repeat what a number of agriculture sector reports have already covered. We wanted instead to create a unique, foundational body of knowledge around smallholder paddy farming practices across the major rice-growing regions of Myanmar.

The agricultural sector is immensely complex, so we decided to focus on the place where the majority of smallholders make their primary income. Paddy and rice is, arguably, Myanmar’s most important economic sector from an equitable growth perspective and is expected to go through a dramatic transition over the next decade. A smooth transition requires a deep understanding of the issues.

We hope this report will support those looking for opportunities to enhance the incomes and well-being of smallholder farmers in Myanmar.



ရသပြည့်



KK



ပိုကောင်း



အဆင့်မြင့်

မြသိန်



အိုအို



Logos from sacks used to transport rice. Sacks are often reused, so logos are rarely an accurate indicator of contents.



မိမိတို့အတွက်



မိမိတို့အတွက်

AAA



မိမိတို့အတွက်

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Above,
Rice traders use
a *kalaung* to pierce
sacks of rice to
preview the quality
of their contents.

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Introduction

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The Paddy to Plate team employs a human-centred design approach to understanding the farming ecosystem—different, yet complementary to the usual quantitative research. Our empathic approach of talking with and observing people in their natural habitat provides a snapshot not just of what people are doing and how, but of why they are doing it. In the coming years, the 'what' and 'how' will likely change. But from our experience, the 'why' will remain fairly constant, providing an anchor from which to understand the future. This approach builds on well-understood human factors and design principles.

We're also attempting to combine an informed macro view of the agricultural sector with a deep understanding of the practices, beliefs, concerns and ambitions of Myanmar's three million paddy growers. The report reflects Proximity's nearly two decades of in-depth and intimate knowledge of the lives of thousands of Myanmar rural families combined with our research and expertise in the broader macro economic environment. We've witnessed the structural transformation taking place in the agricultural sector first-hand, with a presence in townships, villages and fields.

Interest and domestic investment in this sector are growing, while foreign investment lags behind. International aid programs that address agriculture are on the rise but are small in nature. For those who are already involved in the agriculture sector, we hope this body of work/report will provide inspiration to try new things. For Proximity and others that are already engaged, we hope that it will provide guidance in pursuing opportunities that will increase the incomes and enhance the well-being of smallholder farmers.

Jim Taylor
Yangon, 2016

Aims

Of our research, and of this report

- 01 / Establish a foundational body of knowledge around small plot paddy farming practices in targeted regions of Myanmar.
- 02 / Identify opportunities to support farmers and those in the farming ecosystem to sustain the agrarian sector of Myanmar.
- 03 / Communicate an understanding of the ecosystem of production and trade around paddy and rice within Myanmar and the region, focusing on the effects of that ecosystem on those in farming communities.
- 04 / Establish areas where new practices, education, or technology can play a role in improving daily life and sustainability for smallholder farmers.
- 05 / Determine how Proximity Designs and its partners can best be prepared to provide impactful products and services to smallholder rice farmers.



Abbreviations

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
CSO	Central Statistical Organization
DOA	Department of Agriculture
FAO	Food and Agricultural Organization of the United Nations
FMCG	Fast Moving Consumer Good
HYVs	High Yielding Varieties
IRRI	International Rice Research Institute
MADB	Myanmar Agriculture Development Bank
MAPCO	Myanmar Agri-business Public Company
MAPT	Myanma Agricultural Produce Trading
MDRI - CESD	Myanmar Development Resource Institute - Centre for Economic and Social Development
MEC	Myanmar Economic Corporation
MOAI	Ministry of Agriculture and Irrigation
MPT	Myanmar Posts and Telecommunication (the first telecommunication operator in Myanmar)
MRF	Myanmar Rice Federation
MRIA	Myanmar Rice Industry Association
REXC	Rice Exchange Center
RSCs	Rice Specialization Companies
UMEH	Union of Myanmar Economic Holding
USAID	United States Agency for International Development
USDA	United States Department of Agriculture





Shwebo Paw San

SHWEBO

Paw San Wei from Shwebo—eaten by roughly fifty percent of the population—is the premium rice of choice across Myanmar. However, Shwebo as a region is relatively new to paddy production. Located in Myanmar's Dry Zone, the region has only been able to produce rice paddies since the recent building of a nearby dam and irrigation canal system. So how did this type of paddy, in its infancy, gain supremacy over Paw San from Ayeyarwady, where it has been grown for decades? The rise of this variety's popularity reflects important national and social events over the last two decades of Myanmar's history.

The rise of Shwebo Paw San began with U Tun Ei, a farmer from Tha Lone Village in Shwebo with ties to the Ayeyarwady Delta. When visiting relatives in the region, U Tun Ei was immediately struck by the grain's taste and fragrant smell. He then took some seeds back to Shwebo to see if it would be possible to grow the attractive variety in his farm's drier, sunnier climate. Initially, he intended to grow it exclusively as an offering to Buddha and the monks.

After his first harvest, U Tun Ei began cooking the variety at home, where the rice's distinctive and attractive fragrance caught the attention of other villagers: 'The fragrance when cooked was so good, it was apparent across the village'. The villagers also caught notice of the high paddy yield from U Tun Ei's farm—higher than their go-to varietal, Ma Naw Thu Kha. Eventually, the villagers requested Shwebo seeds from U Tun Ei and started growing themselves.

Farmers in Shwebo grew Paw San Wei for years prior to its gaining national popularity.

Because of Paw San's high yield as paddy and attractive taste and smell, as rice spread, farmers began growing it in villages across Shwebo. However, its soft texture was not appealing to the palette of Shwebo residents, who preferred tougher variety of rice, such as the region's historically produced Ma Naw Thu Kha. Further, farmers and traders in Shwebo were generally unaware of the Paw San variety's popularity in lower Myanmar, rendering the rice stagnant in the market and creating a year-over-year surplus of Shwebo Paw San inside the warehouses of rice mills and traders.

The rise of this variety's popularity reflects important national and social events over the last two decades of Myanmar's history.

In 2008, Cyclone Nargis destroyed much of the southern part of Myanmar, including infrastructure and farm land, and a majority of the Ayeyarwady Delta, the country's predominant rice-producing area. With a deficit of rice in the wake of the cyclone, the standing government introduced an effort to collect 'relief rice' and called on all of the nation's rice-producing regions to contribute to a stock in Yangon and the Delta to feed the recently devastated region. Millers in Shwebo were happy to help, as their stockpiles of an unpopular new variety could be offloaded for the sake of relief.

Upon their arrival in Yangon, Shwebo's shipments immediately caught the attention of traders and brokers because its soft texture, beautiful appearance and distinctive fragrance. With a persistent demand and no supply of the current market leader, Pyapon Paw San (Pyapon being at the heart of the region devastated by Nargis), the traders relabeled the Shwebo relief rice as Pyapon Paw San.



This went on for some time, with Yangon brokers repackaging and benefitting from the resale of what was being provided at a subsidy rate as food relief. Over time, through casual conversations between millers and traders in Shwebo and their colleagues in Yangon, the truth presented itself: Their unmarketable product had become quite marketable (and lucrative) in the Yangon market. The business people formed a coalition to reclaim their rice and lay claim that the premium brand that city dwellers had been enjoying was Shwebo Paw San.

Shwebo Paw San is now the market leader and most preferred rice in Yangon, commanding a higher price domestically than other premium rice varieties (e.g., Jasmine and Basmati) abroad. Though it has won an international award for its good taste, its lack of quality consistency, and implementation of Environment, Health, and Safety (EHS) standards pose challenges to exporting it internationally.

Upon its arrival in Yangon, Shwebo's shipment immediately caught the attention of traders and brokers because its soft texture, beautiful appearance and distinctive fragrance.

Shwebo farmers, especially those in Tha Lone village, have prospered from the grain's popularity. The family of U Tun Ei, however, has since sold off their farm land in order to pay for medical expenses. His three daughters and one son are keen to farm again, and look forward to a time when they can carry on their father's legacy.

Special thanks to Daw San San Win, Daw San San Aye, Daw Thidar Aye, and Ko Moe Win for sharing the story of their father, their family, and their village.

Paddy Farmer Glossary

မျိုးစေ့

Myo Sae: Seed

ဆန်

San: Rice

စပါး

Zapa: Paddy

ထမင်း

Htamin: Cooked or steamed rice

စပါးနံ

Zapa Hnan: Rice stalk

ဆန်ကွဲ

Za-kwe: Broken rice

ဖွဲ

Phwal: Inedible outer husk layer of rice with many uses from fuel in power plants to mulch and abrasives

ဖွဲနု

Phwal Nu: Rice bran produced from the outer layer of the rice grain

ဖွဲပြာ

Phwal Pya: Ash from rice hulls

စပါးလုံးရွေး

Zapa Lone Yway: Daily chore that women do to separate paddy from rice before cooking

ဆန်ပြာ

San Pyar: Daily chore that women do to get rid of dust and broken rice from rice before cooking

ခပ်ချက်

Khet Chet: Good quality rice that is ready to be cooked without additional manual processing by consumers

ကောက်ရိုး

Kout Yoe: Dried stalk

ပိုး

Poe: Pest

ရောဂါ

Yaw-ga: Disease

ကေကွက်၊ စံပြကွက်

Acre Kwet/San Pya Kwet: Modernised plot where the fields are leveled and measured into one acre plot each, and boundaries are redrawn physically and officially at the Land Records Department. Paths and ditches are also systematically built into the fields.

လယ်

Lel: Land used to grow paddy

လယ်သမား

Le' Thamar: Farmer who grows paddy

ယာ

Yar: Land used to grow beans and pulses

ယာသမား

Yar Thamar: Farmer who grows beans and pulses

ကိုင်း

Kai: Fertile sediment soil used to grow crops in the dry season

ခြံ

Chan: Land used to grow vegetables and fruits

တောင်သူ

Taung Thu: Farmer who grows vegetables and fruits

ထွန်ရေးပြင်ချိန်

Htun Yay Pyin Chain: Time period when farmers start to prepare for plowing

ထွန်သိမ်းချိန်၊

ထွန်တုံးပိတ်ချိန်

Htun Thein Chain/Htun Tone

Peik Chain: Time period when farmers finish plowing

ထွန်ချ

Htun Cha: Start plowing

ထွန်ရေးညက်အောင်ထွန်

Htun Yay Nyat Aung Htun: Plowing thoroughly

ကောက်လှိုင်းသိမ်းချိန်

Kout Hlai Thain Chain: Time period that bundles of paddy stalks are taken to the storage from the field

ကောက်သင်းကောက်

Kout Thin Kout: Gathering leftover grains in the paddy field by hand after harvest

ငါးပုံကျစက်

Nga Pone Kya Set: Small rice mill typically found in small towns

ဟာလာစက်

Halar Set: Rice huller typically situated in a village that processes local paddy for household consumption

တန်တပ်ရာစက်

Ton Tayar Set: Rice mill that can process 100 tons of paddy per day

ကတ္တာ:

Katta: Analog scale used to measure weights of various crops

စပါးကျီ

Zapa Kyi: Paddy storage

ဂိုထောင်

Go Htaung: Storage building

ကလောင်

Ka Laung: Sharp metal spike used to sample rice without opening the sacks

ဘဏ်

Ban: Bank

ကန်

Kan: Lake

ဆည်

Se': Dam

ရေကာတာ

Yay Karta: Levy

လယ်ကန်သင်း

Le' Kathin: Farm boundary, such as an embankment

ဒစ်စကိုကြွက်

Disco Kywet: Disco rat. A small rat with Mohawk-like hair that reproduces at an exponential rate

ကြွက်ဝမ်းဖြူ

Kywet Won Phyu: White-bellied rat

မြေကြွက်

Myay Kywet: Large field rat that lives underground

ထမင်းစားပြီးပြီလား

Htamin Sar Pyi Pyi Lar: "Have you eaten rice?" It is a common way of greeting in Myanmar culture that is equivalent to "How are you?" in Western culture.

ဆည်ရေသောက်လယ်

Sel Yay Thout Le: Field that is irrigated from a dam

မိုးကောင်းသောက်လယ်

Moe Kaung Thout Le: Rain-fed field

ရေနက်ကွင်းလယ်

Yay Net Kwin Le: Rain-fed field in the lower ground i.e., deep water field

ရေတော်မိုးတော်လယ်

Yay Taw Moe Taw Le: Rain-fed field on higher ground

မျက်နှာသစ်

Myet Nar Thit: Colloquialism for alternate wet and dry irrigation that literally translates to "washing face"

ဆန်ကြမ်း

San Gyan: Long-grain, non-sticky, firm rice regarded as "inexpensive rough rice" by Myanmar consumers

ဆန်ချော

San Chaw: Short-grain, starchy soft rice regarded as “higher valued smooth rice” by Myanmar consumers

သက်ကြီးမျိုး

Thet Gyi Myo: Late-maturing variety

သက်လတ်မျိုး

Thet Latt Myo: Medium-maturing variety

သက်ငယ်မျိုး

Thet Nge Myo: Early-maturing variety

ကြဲစားစိုက်

Kyel Sar Site: Planting method that involves broadcasting seeds (rather than transplanting them)

သီးထပ်စိုက်

Thee Htat Site: Double-cropping

တံစဉ်ပစ်

Tazin Pyit: A 100% failed harvest after which farmers throw away their now-useless sickles

ကောက်စိုက်သမ

Kout Site Thama: Female transplanters

ထော်လာဂျီ

Htaw Lar Gyi: Low-tech, small open truck used for transporting people and goods

ပိုးထိ

Poe Hti: Bitten by a snake—a common hazard from working in the paddy field

ဂဏန်းညှပ်

Ganan Nyat: Getting pinched by a crab—a common hazard from working in the paddy field

မျော့တွယ်

Myawt Twel: Getting attacked by a leech—a common hazard from working in the paddy field

ငုတ်ဆူး

Ngot Su: Injury from stepping on a large thorn—a common hazard from working in the paddy field

နေလောင်

Nay Laung: Sun burn—a common hazard from working in the paddy field

သီးနှံပေါ်

Thee Hnan Paw: A type of loan that allows farmers to pay back their debt only after harvest

စပါးပေး

Zapar Pay: A type of loan that farmers can pay back the debt with paddy instead of cash

ရွှေပေါင်

Shwe Paung: Getting a loan using gold as collateral

အမတော်ကြေး

Ama-taw Kyae: Farm loan issued by the government

စရံငွေ

Sayan Ngwe: Deposit

ကွင်းပျော်ငှက်

Kwin Pyaw Nget: Birds that commonly reside in the fields

တုတ်တုတ်ငှက်

Tote Tote Nget: A bird's chirp "Tote Tote, Tote Tote"

ပိုးချည်မျှင်

Poe Chi Myin: Spider's web

ဖားရှာငါးရှာ

Pha Shar Nga Shar: Earning a livelihood by hunting frogs and fishing

ဖားတွေ မိုးခေါ်နေပြီ

Pha Dway Moe Khaw Nay Pyi: Frogs signaling the onset of rain.

နွားရိုင်းသွင်းချိန်

Nwa Yine Thwin Chain: Time when herds are brought back to the village

အိပ်တန်းတက်ချိန်

Ate Tan Tet Chain: Time when birds go to bed

နေဝင်ချိန်

Nay Win Chain: Time when the sun goes down

ရောင်နီလာချိန်

Yaung Ne Lar Chain: Time when the sky turns red

သက်ကြီးခေါင်းချချိန်

Thet Gyi Gaung Cha Chain: Time when old people go to bed

လင်းကြက်တွန်ချိန်

Lin Kyet Ton Chain: Time when cocks crow

ဆွမ်းချက်ချိန်

Swon Chet Chain: Time when rice for offerings to monks are cooked

အရင်းရှင်

Ayin Shin: Capitalist

ပညာရှင်

Pyinyar Shin: Technician

ဆိုင်ရှင်

Sai Shin: Shop owner

ဒိုင်

Dai: Wholesale buyer

စက်ပိုင်

Set Pai: Miller

ပွဲစား

Pwe Sar: Broker

ကုန်သည်

Kone Thel: Trader

ဘောက်သမား

Bout Thama: Day labourer

ကျပ်နိုး

Kyapan Day: Labourer

ကြွေးပူ

Kyway Pu: Debt that urgently needs to be repaid; literally “hot debt”

ကြွေးအေး

Kyway Aye: Debt that can be repaid at the farmer's convenience; literally “cool debt”

ကြွေးသံသရာလည်

Kyway Thanthayar Lel: Always in debt

ကောက်ပင်ရိတ်လို

စကားပြောနည်း

Kout Pin Yeik Lee Sagar Pyaw Nee: Skillful way of debating, in which the speaker refers to the most basic points to win the argument; literally as if rice stalks are being held tightly and cut from the base

ဘီလာ

Bee Lar: Aquatic insects exported to China

လယ်ကြွက်

ကျပ်တိုက်ချောက်

Lel Kywet Kyat Tai Chauk: Smoked field rat sold in the market—a rural delicacy

ငါးရှဉ့်

Nga Shint: Eel

သမ

Thama: Co-operatives. This word has a negative connotation to most people in Myanmar due to the country's socialist past.

စိုက်ဘဏ်

Site Ban: Agri-Bank, a short-term for Myanmar Agriculture Development Bank

Figure 0.01
WEIGHTS & MEASURES

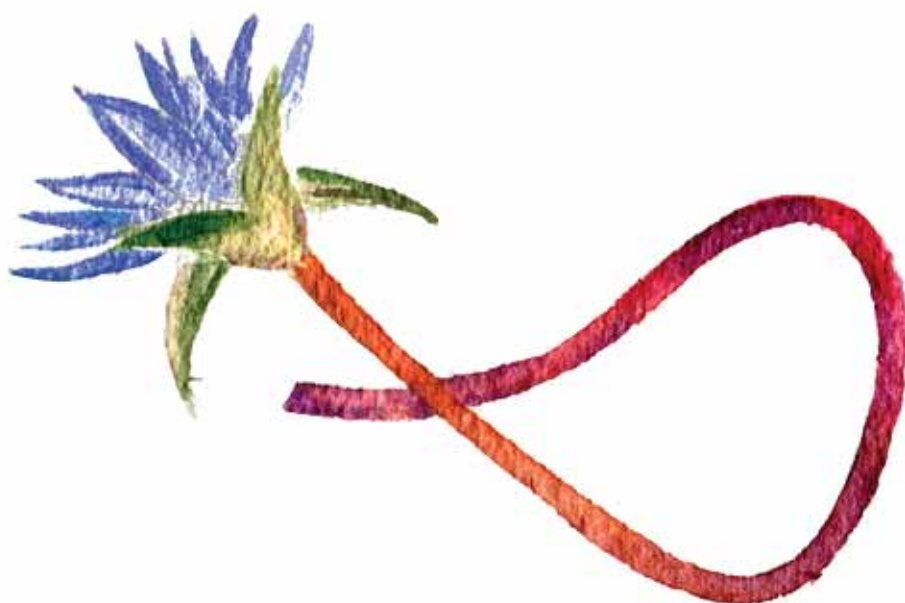
LENGTHS	STANDARD CONVERSION	ACTUAL LENGTH
1 let-ma	1 inch	Length of 1 thumb
1 mike	4.5 inches	Length from 1 thumb-up to bottom of fist
1 htwar	9 inches	Length from 1 thumb-up to tip of spread pinky
1 taung	18 inches	Length from the tip of the finger to the elbow
1 kite	36 inches / 1 yard	
2 mike	1 htwar	
2 htwar	1 taung	
2 taung	1 kite	
Let 1 Thit	Cross section width of 1 finger	
Let 4 Thit	Cross section width of 4 fingers	

AREA	STANDARD CONVERSION	ACTUAL AREA
1 kwet	1,000 square meters / 1,210 square yards	A plot for 1 transplanter
4 kwet	4,000 square meters / 4,840 square yards	A plot for 4 transplanters
4 kwet	1 acre	1 plot for 4 transplanters Ways to get 1 acre: 120 yards x 40 yards 100 yards x 48 yards 80 yards x 61 yards 70 yards x 69 yards

VOLUME	STANDARD CONVERSION			
1 cup	300 ml			
1 pyi	8 cups			
1 khwet	4 pyis	32 cups		
1 basket	4 khwets	16 pyis	128 cups	38.4 l

WEIGHT	STANDARD CONVERSION	
1 kyat thar	15.9 g	
1 viss	100 kyat-thar	1.6 kg
630 viss	1 tonne	

VOLUME	VOLUME TO WEIGHT CONVERSION	
Government Conversion		
1 basket	50 lbs	22.7 kg
1 pyi	3.125 lbs	1.42 kg
Mill Conversion		
TO BUY:		
1 basket	45 lbs	20.45 kg
1 pyi	2.8125 lbs	1.28 kg
TO SELL:		
1 sac	50 kg	1,000 kg
20 sac	1 tonne	



Right,
The baydar is a common
pond-flower found
throughout Myanmar.
Farmers use the length
of the plant's stem to
measure the depth of
the water.

Background: Myanmar Rice Industry Past & Present

The rice industry is the backbone of the Myanmar economy. The country's food staple, rice is the leading indicator of the fluctuations in Myanmar's prosperity over the past two centuries.

Colonial Era

In the early 20th century, Myanmar was the world's top exporter of rice.

The beginning of the golden era for the Myanmar rice industry began in the 1850s with the British annexation of lower Burma, when rice began to be grown in the Ayeyarwady delta as a cash crop for export to Europe and other British colonies. The colonial government invested heavily in infrastructural support for the rice industry, building canals for transport and clearing land for rice cultivation. Under colonial rule, rice mills and major exporting companies were owned by the British, who elevated rice in Myanmar from a simple sustenance crop to a major export commodity. In the late 1800s and early 1900s, financial support for the rice industry in the form of land purchases, improvements, and crop loans were provided by Indian money lenders, known as Chettiers. Under conditions set by the Chettiers, loans were backed by land as collateral.

The depression era of the 1920s and early 1930s resulted in a crash in global rice prices. The decline in rice prices rendered farmers unable to repay loans to the Indian Chettiers, so many lost the land they had offered as collateral. The resulting rice farmers' losses fostered widespread anti-foreign sentiment, which later influenced post-independence land and agriculture policy.

In the years leading up to World War II, Myanmar climbed to the peaks of global rice production, with the 1930s being the heyday

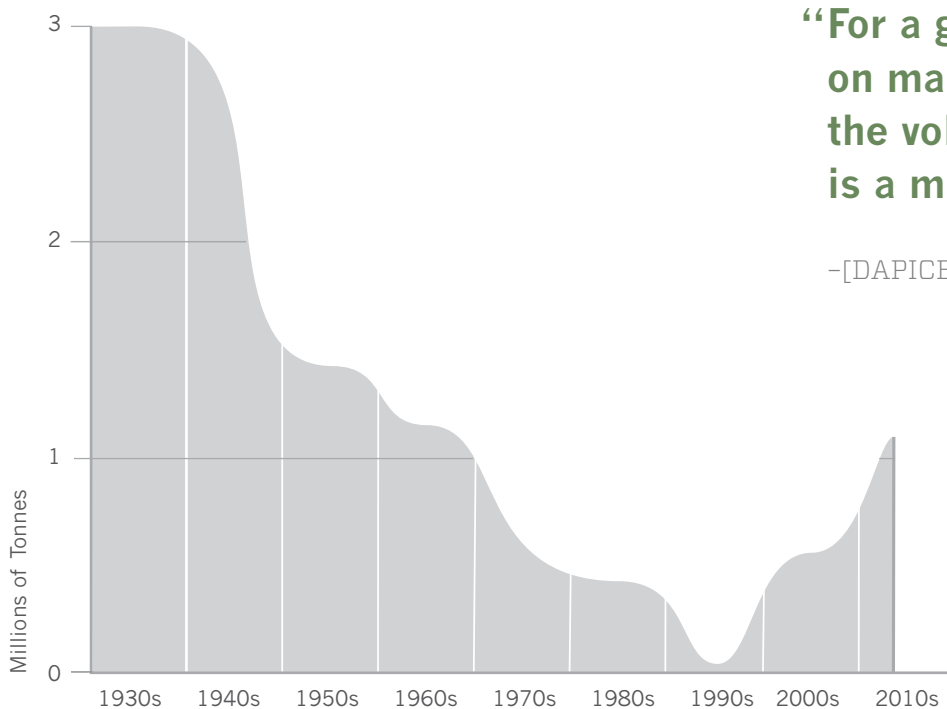
of Myanmar's rice export industry. Over 3.4 million tonnes of rice were exported between 1934 and 1935, almost one-third of the global rice trade at the time. Myanmar was widely recognized as the "rice bowl of Asia".

Much of the rice industry was devastated by the onset of World War II. Almost all agricultural infrastructure was destroyed, including rice mills and livestock used in farming. The Japanese occupation forced British rice companies, along with the Chettiers, out of Burma, effectively driving out the only formal access that farmers had to private capital. The post-independence government nationalised the rice industry, outlawed foreign ownership of land, and made illegal the use of land as collateral against loans.

Post-Independence Period

Nationalisation of the rice industry by the post-independence government was, by all measures, an utter disaster. By the 1950s, rice exports had halved to 1.45 million tonnes, and by the 1960s, they were down to 1.2 million tonnes. By the 1980s, Myanmar was exporting less than half a million tonnes, and in 1997, exports declined to an all-time low of just 15,000 tonnes. The government set rice quotas for farmers, but because of unfavourable prices, farmers resisted the required quotas and sold low-quality rice to the government, thereby causing a decline in exports. Stalled investment in milling and transportation technology following nationalisation left the rice industry stunted.

Figure 0.02
Volume of Rice Exports in Myanmar
by Decade



“For a government fixated on maintaining stability, the volatility of rice prices is a major political threat.”

–[DAPICE]

At every level of the rice supply chain, poor investment and planning left members of the ecosystem impoverished and Myanmar rice quality and prices dismally uncompetitive for the global market.

Neighbouring countries that had lagged behind developmentally in the early part of the 20th Century, such as Thailand and Vietnam, surpassed Myanmar in rice production and exports.

Still today, for a government fixated on maintaining stability, the volatility of rice prices is a major political threat. While low rice prices appease urban populations, they are a threat to the survival of farmers who benefit from higher prices. The government has yet to develop an effective way of maintaining price stability, primarily restricting the movement of rice to control prices rather than sales or procurement of rice. (Dapice 2014)

Past Decade and Recent Reforms

Rice has historically been a political crop in Myanmar. For example, a rapid increase in food prices was a major trigger for the historic 8888 uprising, when many students and urbanites joined ranks against the regime. Protesters angrily chanted, “San Ta Pyi Shi Kyat, Sein Lwin Gaung Ko Phyat!”, which roughly translated to a call for Sein Lwin, President of Myanmar for seventeen days in 1988, to be beheaded as rice rose by 33 percent to eight kyats per pyi.

In the past decade, the Myanmar leadership has finally decided to resurrect the rice industry. Beginning in 2003 and accelerating since 2009, the liberalisation of rice production and exports has breathed new life, albeit slowly, into Myanmar’s rice industry. Despite a dip in export volume in 2014 due to quality control issues, Myanmar rice exports overall have been trending upward. According to recent data, total rice production has steadily increased to almost 12.5 million tonnes in 2014–2015, while total exports jumped from under two million tonnes in 2013–2014 to almost 2.5 million tonnes

Flooding in Myanmar

July – August 2015

Myanmar has always been vulnerable to hydroclimate extremes, with exposure to cyclones and a high risk of flooding (Baroang 2013). Those extremes are expected to become more frequent and intense due to climate change. According to the LIFT 2012 Households Survey, farmers in food-insecure regions of Rakhine and the Dry Zone listed climate-related concerns such as floods, landslides, and droughts as their main agricultural constraint.

In mid-July and early August, Myanmar went through the most severe flooding in recent history, affecting over a million people in the Magwe, Sagaing, and Ayeyarwady regions, as well as Chin and Rakhine states. The severity of damage varied across different locations: some villages disappeared overnight; some farmers lost their entire crop; all the rice fields were submerged but not destroyed in some regions; some faced life-threatening landslides; while some were barely affected. Many villages in remote Chin and Rakhine states were still in need of evacuation as of late August. Some villages still remain hard to reach due to damaged transportation links.

Overall, the flood damaged 1.45 million acres and destroyed 841,000 acres. (National Disaster Management Committee 2015) According to the government's framework for medium-term recovery, the first focus was agriculture and food security. (Thein 2015) As the flooding news spread across the country, local rice prices increased by about eleven percent by the end of July. In order to stabilise local rice prices, Myanmar authorities suspended rice exports on August 1st.

After holding off all rice exports for 45 days, exports resumed in small volumes as the Ministry of Commerce approached the issue cautiously, with an eye on domestic demand and stability. U Aung Naing Oo, vice chair of Myanmar Rice Federation, estimated that exports are likely to fall about 200,000 tonnes short of last year's total of 1.8 million tonnes. (Aung 2015)

While experts predict there will be sufficient rice stock for domestic consumption to last until the next harvest in November, annual rice production will be significantly less than previous years because thousands of rice fields have been damaged or destroyed. Due to the decreased supply, paddy prices during November 2015's harvest rose by at least 25 percent over last year.

ANNUAL RAINFALL IN MYANMAR

5,000 mm/yr

in coastal
and Delta
area

this year. The Myanmar government aims to increase exports to over four million tonnes by 2019 (World Bank 2014).

The rise in rice exports is the result of several policy reforms, including rescinding of permits to transport rice to border areas; reducing the export tax from ten percent to two percent and later suspending the tax; consolidating the official and black market kyat-dollar exchange rates; liberalisation of export prices; withdrawing the requirement that exporters must have half the volume of rice for which they seek licensing to export; and opening up rice exports to all traders by no longer restricting export licenses to Rice Specialised Companies (RSCs) (World Bank 2014).

If policy trends continue to be positive, the establishment of a stable, flourishing domestic rice industry and peak export volumes will lead to much-needed investment in technology, knowledge, and infrastructure. This in turn will generate access to appropriate credit for farmers and other critical players in the rice ecosystem.

Regional Differences

While Myanmar has a dominant tropical monsoon climate, its climate variability and agro-climate regions are largely shaped by topography. Annual rainfall significantly varies across the country from 600mm in the central Dry Zone to 5,000mm in the coastal and delta regions. Temperature ranges from about 43 °C in the central region to 29°C at the eastern plateau. (Baroang

2013) In addition, the availability of water resources and soil types influences a region's agricultural potential. Though Myanmar has abundant water resources, with groundwater and five major rivers, water availability varies seasonally and spatially as the rivers mostly follow rainfall patterns. Delta areas of the Ayeyarwady, Sittaung, and Chindwin rivers naturally become major rice-growing regions. Although there are some upland rice-growing areas in hilly regions, the amount of rice produced there is insignificant.


Over the course of our research, we traversed Shwebo in Sagaing Division, Pyay in Bago Division, and Danubyu in the Ayeyarwady Division, with each location representing a set of similarities and uniqueness in terms of irrigation, soil quality, farming habits, and access to market.

Our first destination was **Shwebo**, situated in the Dry Zone. Its recent emergence as a major rice-growing area in the country motivated us to learn about its farming ecosystem and the players involved in bringing the "Shwebo Paw San" rice variety to fame in the domestic market. Prior to 2001, farmers in the region did not have adequate water sources for growing paddy year-round. The 2001 completion of the Thaphanseik Dam, the largest of its kind in the nation, enabled year-round irrigation for over half a million acres, with feeder canals extending to eight townships in the region. This dramatic improvement in access to water for irrigation has greatly influenced farmers' decision on which crops to grow. With improvement in irrigation and better market opportunities for Shwebo Paw San,

600 mm/yr

In central
Dry Zone

0

A faint map of South Asia is visible in the background, showing the outlines of India and Bangladesh. The text is overlaid on a white rectangular box.

“It is hard to fully communicate what years of policies like this have done to the capital stock of the rural economy. When farmers and rural landless are hard pressed, they do whatever they can. They use up natural capital. They over-cut firewood, depleting forests. They over-fish, depleting future catches. They use the land too intensively, planting on steep slopes that erode or fail to plant crops that produce little immediate income but put organic matter and nitrogen back into the soil. Indeed, government policy has forced farmers to plant back-to-back paddy, crowding out crops that would enrich the soil and which farmers would prefer to plant. Of course, improvements to the soil are out of the question when policy is pushing in the other direction. The result is farmers are slowly destroying the environment on which they depend.”

– David Dapice, 2014



farmers have taken zealous steps to improve productivity by increasing use of fertilisers and pesticides. As they begin to grow both monsoon and summer paddy, the traditional practice of letting the soil rest between seasons (crop-rotation) has also been abandoned in many villages. Consequently, natural biodiversity in the region has been disrupted, leading to degradation of soil quality and increasingly frequent pest outbreaks. Shwebo has faced massive outbreaks of the yellow stemborer pest every year since 2013. Farmers have reacted to this outbreak with overuse of pesticides, which in turn has led to brown planthopper outbreaks.

Pyay, our second destination, is located in Bago Division. Similar to Shwebo, there are both rain-fed fields and dam-irrigated farmland around Pyay region. The rice industry is significantly weaker in Pyay than in Shwebo, due to the absence of high-quality rice mills and limited availability of good-quality seed. Despite its closer proximity to the capital of Yangon, compared to Shwebo, many farmers are less knowledgeable about the domestic rice market. Many farmers in Pyay are not aware of the final destination of the rice they sell to traders (rice trading in the area is heavily dependent on the China border trade). Infertile sandy soil and rodent infestation are also major problems for paddy farmers in Pyay. Another aspect that differentiates Pyay from Shwebo is the majority of farmers prefer to grow different paddy varieties even in a single village, which leads to an amalgamation of rice of various qualities and different harvesting times.

The third and final location was **Danubyu** in the Ayeyarwady delta. With 6.18 million people, it's the second most populous of the 15 divisions and states in Myanmar, (Department of Population 2015). Danubyu is a flourishing farming town with rich alluvial soils suitable for rice cultivation. In contrast to the farmers in Shwebo and Pyay, the farmers we met in Danubyu tended to be more market-savvy, leveraging their convenient transportation access to Yangon and personal ties through family members and neighbours who have migrated to the city for better job opportunities. Although it does not have a nationally known rice brand like Shwebo Paw San, Danubyu is famous for black gram production in the export market.

Because the farmers are not reliant on dam irrigation, they have more freedom to choose what to grow based on weather and market conditions. Farmers favour the crop-rotation method by alternating between rice and legumes such as black gram. A significant number of rice fields in the Danubyu region are deep-water fields in the lowland and therefore prone to annual flooding in monsoon season, so the farmers who own such rice fields suffer from low yield, which forces them into chronic financial hardship. However, some manage to transform the deep-water fields into fish ponds, which provide a higher return. New trends we observed in the Danubyu area include the rise of contract farming and high-quality rice mills that can process rice on par with international standards.

Methodology

Paddy to Plate is based on primary research using well-established, human-centred design and ethnographic research principles. Research in Myanmar began in July 2015 following six months of planning and coordination, with on-the-ground interviews, data collection, and synthesis with a team of twelve people working over six weeks.

Research Protocol

The research explored attitudes, perceptions, and practices around paddy farming in order to understand the relationship amongst all the players in the paddy-to-rice ecosystem. We wanted to understand how their needs and opportunities could be best addressed through future services. A follow-up project will focus on developing concepts and a pilot of one or more services.

The team used the following qualitative and empathic research techniques:

In-depth Contextual Interviews held inside the home, field, or workplace, and sometimes including additional contextual visits (e.g., to the rice mill or market). These sessions focused on one family member, such as the farming head of the household, but often

included other people in close proximity. Interviews ranged from 60 to 120 minutes.

Ad-hoc Interviews conducted in villages and local markets, on paddy and rice transportation, and other parts of the ecosystem. These sessions lasted from five to 50 minutes.

Dyads, or pair interviews, to leverage the relationship between two participants (often married couples). This format prompted discussion about different roles and daily responsibilities in making large household and business purchase decisions.

Group Interviews conducted with three to eight people. Sessions lasted up to one hour.

Design and Research Principles

- 01 / While everybody deserves good design, the poor can least afford poor design.
- 02 / Research is not just for researchers.
- 03 / Talking with and listening to the people for whom you are designing provides the foundational understanding on which great products can be built.
- 04 / The relationship between your team and the people for whom you are designing is present in every aspect of the design.

Observations to better understand behaviours in a diverse range of environments. Sessions ranged from a few minutes to an hour, and often led to ad-hoc and in-depth interviews.

Subject Matter Expert Interviews conducted with government advisors, rice traders, exporters, and members of MAPCO, DOA, and IRRI.

Leveraging Proximity Designs' extensive field presence, the team immersed themselves in the use of products and services, including applying pearl urea fertiliser, testing the moisture and yield of paddy, transplanting and harvesting rice, assessing rice quality, sampling a wide array of cooked rice, snacks

and rice products, and brewing moonshine. In order to gain a functional understanding of each node of the rice ecosystem, the team conducted activities such as shop-alongs with brokers at the san dan (rice store) and warehouse visits.

These methods were complemented by a literature review (covered in the references section) and internal reports from Proximity Designs. Our immersive approach supported a stronger empathic understanding of participants. Wherever possible, we tried, used, and explored the boundaries of the products and services that we needed to understand. The team discussed ethical issues as they arose.

Research by the numbers

120	Ethnographic interviews
19,227	Photographs
3,152	Rows of data captured
5	Mills visited
1	Sack of Shwebo Paw San purchased

Participants

The team identified participants across the entire paddy-to-rice ecosystem. These included a range of rice farmers, day labourers, service providers, brokers, traders, millers, and consumers. At times, we steered into analogous topics that impacted rice practices, such as duck and fish farming. We also recruited a number of experts, including an experienced rice exporter based in Yangon, the General Secretary of the Myanmar Rice Federation, a former senior official from the Ministry of Agriculture and Irrigation (MOAI), and an agricultural expert from Michigan State University.

Our exploratory research approach allowed us to refine the protocol for interviews and data collection over time and develop more nuanced questions as we acquired more knowledge. After each day's research, we adapted the recruiting profile of our participants based on whom we had met and what we had learned that day. Our local team recruited the participants, with significant support from Proximity Designs' area managers. In-depth interviews were arranged ahead of time.

The purpose of the research was explained in-depth to interview participants, who were encouraged to ask questions about the process and how the data would be used. Our equipment included a mobile printer that was sometimes used to provide hard copies of photos taken as a small thank-you gift.

The team engaged a total of 177 participants, three quarters of whom were male—a reflection of the gender split across the paddy-to-rice ecosystem.

In-depth Contextual Interviews

56 interviews
7 group interviews
8 dyads
12 subject matter experts

Ad-hoc Interviews

30 interviews
7 group interviews

Locations

The team travelled to three strategic locations in major rice-growing areas of Myanmar: Shwebo, Pyay, and Danubyu. Details of each location are described in the Background section.

Proximity's Farm Advisory Services (FAS)

The team was accompanied by a field staff member from Proximity's highly-effective agricultural extension service. FAS field staff have consistent and proven success establishing rapport with farmers and farming communities, and in evoking candor in conversations around practices and techniques. Ko Shwe Myint, our resident FAS expert, both acted as an ambassador between the research team ("city folk") and our participants and as a constant reference for best practices, language/vernacular and farmer mindset as the team collected and synthesized our findings.

Opportunity Areas

Throughout this report, we have included specific call-outs to indicate areas we believe to be ripe for product, service or policy innovation. These are informed by our field work described herein, deep expertise in the Myanmar market and by the team's decades of experience in the design and product development space.

Process

Every project has a learning curve. The trick is to understand the team's starting point, what is needed to rapidly get up to speed, and when the current methodological mix is no longer producing a good return on investment.

In commercial research programs, client pressures typically limit the team's ability to step away from agreed numbers of participants or adapt methodology and approach as insight is gained. Based on the aims, funding, and qualitative/exploratory nature of this project, our team had no such constraints.

For each location, an advance team travelled ahead to scout out a suitable popup studio location, lay the groundwork for in-depth participant recruiting, and build initial relationships with village leaders. Although the team aimed for five or more in-depth participants in each location, the team only required three to be fixed ahead of time, as this was a relatively easy market in which to snowball-recruit. The team fixer played a key role in presenting village options to the research team prior to their arrival, so the villages visited could be prioritised per the project aims and the team's time would be spent optimally.

In-field synthesis took place in three ways: Informal debriefings with field teams after each research session; daily full-team debriefings to discuss key findings, possible improvements to the process, and goals and plans for the following day; and on-site meetings of the field team to create a high-level, synthesised summary of findings for that location.

While the length of time spent in the field was shorter than that of many academic studies, it was still greater than most corporate research projects.

Data

One team member, the data manager, was responsible for cataloguing and backing up data. All written data was scrubbed of identifying information (name, village) before entering the workflow, and the names of people and places used in this report were changed. Small gifts and small financial rewards were prepared for in-depth interview participants and handed out depending on what was appropriate in each context.

The study generated 1,839 observations and insights, and 19,227 photos—a fairly typical amount for a study of this nature.

Time of Year

Agrarian societies such as Myanmar are shaped by the wet and dry seasons. This impacts which contexts and activities can be observed, the participants available (given increasing seasonal migration in some parts of Myanmar), the topics on participants' minds, the direction of interviews, and the likelihood that responses are accurately recollected.

Quotes

Throughout this document, we use direct quotes, translated from Myanmar to English. Each quote is attributed to the participant using a coding system that retains their anonymity. For example, a quote attributed to the fourteenth female in-depth participant is coded as [IND F14].

For Reference

As of 1 March 2016, the exchange rate was 1,240 kyat to US\$1. For the purpose of the report and ease of conversation, we used the following:

kyat = Myanmar's currency

lakh = A commonly used monetary measure

1 lakh = 100,000 kyat

1 lakh ~ US\$100



THE FARMER

The farmer is at the centre of the farming ecosystem. In this section, we document four **Farmer Archetypes** that capture elements of key farmers we've met. The **Environment** section considers the context in which he operates and grows. **Inputs** are things that can be acquired or purchased to farm, grow and manage a crop. **Techniques** are what a farmer does—the actual practices and methods of farming. **Crises and Problem Solving** are obstacles that a farmer faces and solutions he adopts to overcome those, respectively.

We start with a look at a rice farmer's daily life, and his influences. Then, we look at the Alternative Options for Income Diversification and how farmers are getting by and sustaining their livelihood. Finally, the Lifestyle and Outlook of farmers are examined to appreciate farmers' perceptions of the world.

"I don't have a specific plan, but if there's a drought, I will pump up from the tube well, then have a nursery farm instead of doing the regular

wait for rain. That's about it for planning, because I don't know when the pests will come—same with the weather. We are not technicians; I can only look at the clouds. We are not educated. Our kids are educated, but they don't want to work on the farm". [SHB-IND-M09]

The major threats that farmers face are actually preventable and manageable. However, farmers are strained by outdated infrastructure and a deficit of practical knowledge.

“The guys in town with the biggest houses and the Land Cruisers, those are the land records guys.”

– Anonymous Myanmar Policy Expert

Land Security

Land-taking as a political issue will not be addressed in this report (as it has been covered comprehensively in others, such as (Oberndorf 2012)). Uncertainty over land ownership negatively impacts the psychology of farmers, which translates into their practices and livelihoods.

“[The military] just came one day and told us that we were trespassing [on our land]. They did not issue a warning or give any papers”.

[PYI-IND-COU02]

In Pyay, we were surprised to hear stories of villages coming together and successfully gaining legal ownership of their land (after significant time in court), after it was seized without warning by the military in the early 2000s. These villages had a resounding spirit of camaraderie—with a higher number of communal projects (such as wells and road developments) than elsewhere in similar villages. However, just one village over (a short walk down the road), farmers are still fighting the Ministry of Electric Power for land—some of which had been seized a decade ago and is still lying vacant. Farmers with enough land elsewhere have abandoned farming on their seized land in fear of being arrested for trespassing, while others who do not are forced to farm their land “illegally” to support their families.

“...I don’t want to plant summer paddy, because I worry that my land will be taken before I can harvest it. We are farming in fear”.

[PYI-IND-COU02, a farmer who is at court

with the military to reclaim land that was seized in 1996 (and remains undeveloped)]

Fortunately for the victorious villages in Pyay, many of their inhabitants were college educated and therefore able to effectively navigate the complexity of the legal system and policies in place. Processes implemented by land records and the corresponding ministries are difficult to understand by villagers and often self-serving.

“The guys in town with the biggest houses and the Land Cruisers, those are the land records guys”. [Anonymous Myanmar Policy Expert]

Climate & Climate Change

According to the Intergovernmental Panel on Climate Change’s (IPCC) 2013 Global Climate Risk Index, Myanmar ranks second globally in terms of the threat posed by agricultural-productivity loss due to climate change. Increased weather extremes have caused prolonged drought in Myanmar’s Dry Zone, while critical flooding is common in Myanmar’s deep-water regions, especially during the annual monsoon season.

Farmers are feeling the effects of climate change, with the late arrival of monsoon and the overall warmer climate affecting their farms and livestock.

“Farmers are supposed to become better and better this year. But they aren’t. It’s mainly because of the weather”. [PYI-IND-F03]

“[The military] just came one day and told us that we were trespassing [on our land]. They did not issue warning or give any papers.”

– Paddy and Vegetable Farmer, Pyay [PYI-IND-COU02]

“A decade ago, we [could] easily estimate the yield. Not anymore. The weather is quite irregular. It’s hard to predict the yield these days”. [SHB-IND-M11]

Natural Disasters

At the time of writing of this report, Myanmar was in the wake of destruction following a string of heavy monsoon storms from the Bay of Bengal. A state of emergency was declared in four states, with critical flood levels displacing families and destroying farms in ten states in Eastern and Central Myanmar.

While seasonal and disaster-related flooding is one concern,, rising sea-levels will affect a large percentage of the population, especially those who live and farm in deep water and coastal areas. The challenge with flooding is twofold: For deep-water farmers, flooding can affect both their plants’ ability to grow (plant height versus water level) and their ability to physically work the land as needed to ensure a successful crop and harvest; for other deep-water agribusiness, flooding can mean loss of product (e.g., fish from a fish farm) and ruined terrain/habitat for duck farming.

“A third of the population lives in areas at risk of flooding, and around ten percent of the country (or five million people) will be affected by sea-level rises of between one to five meters. Other countries may have higher absolute figures for this, but Myanmar’s coping ability is so poor that only Somalia tops it in terms of vulnerability”. (Livelihoods and Food Security Trust Fund 2014)

Deforestation & Hardwood Extraction

Deforestation and development (much of which is unsupervised) have altered the land’s ability to retain water and have caused flooding where previously the ecology balanced out an abundance of water. Furthermore, much of this deforestation is being done as the result of land concessions (as “conversion timber”), under the pretense that cleared land will be used for farming. Of the 1.9 million acres allocated to the private sector for oil palm development in Myanmar, only 360,000 acres (less than twenty percent) had been planted by the end of 2013. (Woods 2015)

“Over the past decade, the government of Myanmar has allocated nearly two million acres of land in large concessions to local agribusiness companies and, since 2010, to foreign investors. Some of the large concessions have proven commercially successful as farming businesses. Other concessionaires appear to have limited interest in farming and instead gain land rights in order to enable mineral extraction, lumbering or land rental to smallholder sharecroppers”. (Michigan State University et al 2013)

A dissonance between the MOAI and the Ministry of Environmental Conservation and Forestry (MOECF, charged with preservation of forests) over agricultural use of land versus preservation is believed to be fueled by the motives of the ministry and its affiliates to perpetuate hardwood extraction.







Left,
A farmer in Pyay
fertilises his crop

Unfortunately, this tension is further reflected in the behaviour of some farmers, who, due to the low productivity of their farms and their inability to invest, will practice in ways that do not benefit the longevity of their farms.

“Farmers want to grow on every inch of the land. They don’t even leave behind shade trees. That’s why there is no tree to retain moisture for rain”.
[SHB-IND-M07]

Ecology & Soil Health

Soil nutrient density varies greatly across Myanmar, as do factors that affect the maintenance of soil quality. We encountered farmers facing challenges with “slippery” soil, sandy soil, acidic soil, and dry soil, and have heard accounts of others with mineral deposits (namely sodium bicarbonate) and key elemental deficiencies. As a key factor in determining not only what can be grown but the quality of the product, farmers’ understanding of their soil and its condition is critical to long-term productivity of their land. In the Techniques section, we share how farmers think about their land and the measures they take to keep it productive and healthy.

Weather Forecasting

While there are many conventional ways to predict the weather, there is a deficit of reliable and localised meteorological weather forecasts. With national forecasts highlighting

division- or state-level weather only, it is nearly impossible for farmers and others in agribusiness to gain useful information from weather services and forecasts. Furthermore, the information that is most useful for farmers, like seasonality (how late or early weather will be) and hyper-local factors that will affect their crops directly (namely rain that can dampen grain and strong winds/rain that damage plants) are difficult to predict at the level of detail that would be useful to them. Even with this information, farmers lack the ability/knowledge to act on weather information, depending on its format and the means by which it is transmitted. A Thingyansa, a document similar to a farmer’s almanac, used to be a common reference for farmers; however, it has become less and less popular with modern farmers, as superstitions have waned in recent generations.

Common sense and tactical logic tend to prevail in the farmers’ response to weather information. Forecasts are compared to their own experiences, and if forecasts conflict with personal experience, advice based on forecasts is often discarded. U Tun Lwin, a famous weatherman in Myanmar, had warned of potential flooding in the whole country (with a strong focus on the Sagaing State Division) while we were in Shwebo (two to three weeks prior to writing this report). We learned of this while in Shwebo; we met farmers on the first day of the monsoon rain, who mentioned having heard the forecast and commented that U Tun Lwin did not have knowledge on regional weather, and therefore

“There has been an increase in irrigated area, driven largely by government investments. But, over time, the effectively watered areas of these projects decline as irrigation maintenance is neglected.”

– David Dapice, 2014

his forecast would be wrong. As it turned out, there were consecutive heavy rains in the Sagaing Division shortly thereafter, causing massive flooding in the region.

“U Tun Lwin must be confused. He gets it all wrong. In Shwebo, we have never gotten any rain because of a storm from the Bay of Bengal”.
[SHB-IND-M03]

An important adverse effect of irrigation has been a gradual disconnect from weather and the monsoon rain to which farmers were previously beholden. While in Shwebo and Pyay, we observed on multiple occasions farmers rushing to cover their crops with tarps after they had been hit by a downpour, and we picked up on a lack of interest in weather for irrigated villages, whereas those who still relied on rain were acutely aware of when the rain might come and how to act accordingly. Given the weak and often strained state of existing water management infrastructure, coupled with the significant

impact rain can have on the quality and subsequent market value of a crop (especially around harvest time), farmers still need to pay attention to the weather, even if they have auxiliary systems of supplying water.

Water Access & Control

Many areas across Myanmar are now able to grow paddy, where previously it was impossible due to an increase in damming and irrigation infrastructure over the past 30 years. In Myanmar, paddy is grown on 18.76 million acres for both summer and monsoon paddy. According to official data, 48 percent of paddy farm land is rain-fed while only 20 percent have access to irrigation. (Ministry of Agriculture and Irrigation 2013) Many more areas of Myanmar can benefit from investments in irrigation infrastructure.



Above,
An irrigation canal
near Pyay

However, irrigation has also introduced challenges. In Shwebo, despite a desire by many farmers to diversify or take seasons off, poor irrigation management has eliminated the possibility of controlling the water that enters their land, resulting in land being irrigated sometimes against the will of the farmer. Maintenance of infrastructure has been a huge challenge, and as it deteriorates it creates an inequality amongst farmers, depending on their proximity to the water gate. The combination of uneven land and a lack of pressure mean irrigation often has to run constantly for a significant period of time in order to reach outer plots, thus rendering plots nearest to the water source water-logged and sometimes unusable.

“The dam releases water, so we have to grow summer paddy. We want to grow peas and sesame”. [PYI-IND-GRP01]

“The soil experiences too much acidity, and we don’t know when it happened or why because the

soil is not rested”. [SHB-IND-GRP02, on irrigation driving farmers to farm season-after-season on their land]

“There has been an increase in irrigated area, driven largely by government investments. But, over time, the effectively watered areas of these projects decline as irrigation maintenance is neglected”. (Dapice 2014)

A manager of irrigation and canal maintenance (who is also himself a farmer) told us that one of the challenges associated with maintenance—besides cost—is the time it takes to make much-needed repairs causes farmers to miss a season of growing. Part of his job is working with headmen and village leaders in the area to agree on times when they will not grow in order to schedule maintenance. Finally, he cites lack of transparency as an issue, as he has little visibility into budgets and project plans, despite having been employed by the irrigation department for thirty years.

Common sense and tactical logic tend to prevail in the farmers' response to weather information. Forecasts are compared to their own experiences, and if forecasts conflict with personal experience, advice based on forecasts is often discarded.

"It takes thirty to forty lakh to fix a canal, but the government will often put fifty on paper and put ten in [its] pocket". [PYI-IND-M02]

The flooding that is currently happening across Myanmar, though triggered by significant weather, has been exacerbated (and in some cases has been more problematic) due to the presence of poorly maintained water management infrastructure.

In Shwebo, farmers shared what happened this year when the government announced the date for the release of summer paddy irrigation. Rather than describing the first day of irrigation, the announcement stated that water release would be limited to certain villages and that farmers in other villages would have to grow the less water-intensive sesame or pigeon peas rather than paddy for their summer crops. Many believe this water rationing (which was seemingly done at random) was a result of last year's mild monsoon and lack of reservoir water. While some welcome the opportunity to grow one of these other crops, they both require significant input cost (labour in the case of sesame; pesticide/input cost in the case of pigeon peas). The larger challenge is the lack of control the farmers face. They are truly



beholden to the government's will in terms of irrigation for their crops and the duration of their growing period.

Farmers have changed how they think about accessibility to water since constant irrigation from the dams has become the norm. Many of the farmers from irrigated villages no longer pay attention to weather forecasts or weather cues about monsoon rain, as their crops are no longer dependent upon them. Old traditions and rituals around calling for rain, such as the "tug-of-war" ceremony for Moe-Kaung-Kyaw-Swar Nat, are slowly dying out.

"I don't worry about the weather because I have irrigation". [SHB-IND-F03]

Figure 1.01

Weather Cues from Nature

FLOOD



Tote Tote birds singing "tote tote, tote tote," indicating water will reach up to the branch on which it perches



Armies of ants moving indoor or to a higher ground

STORM



Birds normally inhabiting rice fields migrating into the village

RAIN



Crickets and frogs singing louder than usual

DROUGHT



Crabs digging holes in the field deeper than usual

SUNNY



Spiders' webs in air flying in day time.



OPPORTUNITY AREA

Throughout Paddy To Plate we identify opportunity areas for improved or future services.

Weather Prediction & Awareness

An overabundance or lack of rain and high winds, and prevalence of sun all have a significant impact on crops across the growing seasons. Without the ability to predict and respond, farmers are unable to protect their crops from adverse weather conditions or take advantage of better weather conditions.

Localised weather predictions, paired with suggestions, can provide farmers with control over the growth, health, and outcome/yield of their crops. Establishing practices and tools for accurate weather prediction and response has the potential to scale with the market to more sophisticated product and service solutions, including the use of sensing technology and automated farm systems.

OPPORTUNITY AREA

Preparedness for /Adaptation to Climate Change Events

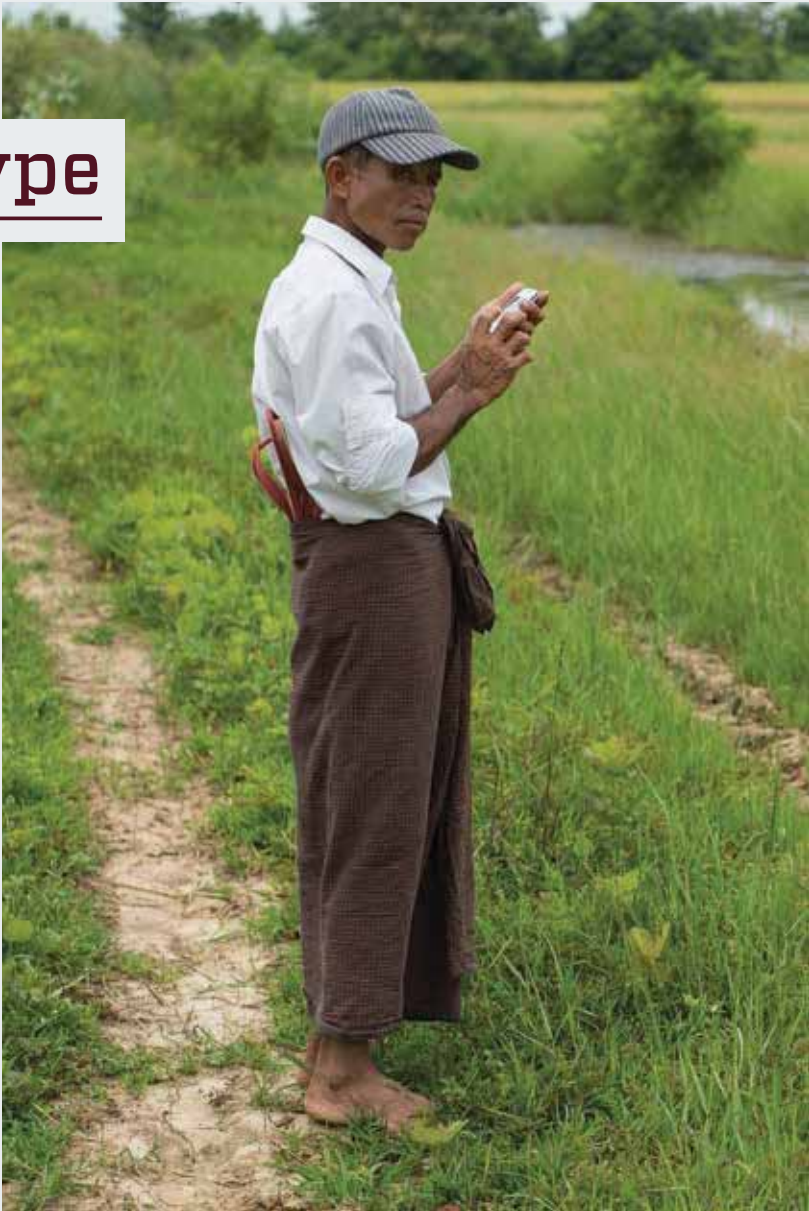
The dire effects of climate change have already been felt by farmers in Myanmar and other countries in the region. While climate change-related events and conditions are not expected to wane, an increasing awareness of the conditions and ability to predict changes has the opportunity to translate into the shifting of farming practices for a more predictable and sustainable agricultural future.

Investing in infrastructure advancements and experimentation with new and re-appropriated farming technologies may be proactive measures that stem the tide of climate-related farming disasters.



Archetype

01



INFLUENCER FARMER

Land Ownership	Income Diversification	Outlook/ World View	Biggest Challenge	Capital Need/ Loan types
20 acres of rain-fed fields, partially in seasonal-submerged area	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> <ul style="list-style-type: none">- Monsoon paddy- Summer black gram- Fish- Duck- Pigs- Shop	10 years <div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	<ul style="list-style-type: none">- High investment but no preventative measures for natural disaster- Subject to charlatans	15-month loan for fish firm

Ko Win Kyi, 40

Danubyu

Family:

Married, with unmarried 18 year old son who is working and studying in Yangon, and a married daughter aged 21 running a small shop at home

Education:

High school drop-out

Ko Win Kyi is a savvy farmer based in the upper delta. Of the twenty acres of land he owns, five are deep water fields, which become flooded up to four feet every monsoon. To efficiently utilise the land, he converted the fields into fish farms five years ago. Fish farming is lucrative but requires a substantial capital investment drawn from savings, his other sources of income, and informal loans; he has also invested in raising pigs and ducks. The high diversity of his income is unique amongst his peers. On his remaining fifteen acres, he grows paddy in the monsoon season and black gram in the dry season. His daughter runs a small shop at home that sells groceries, diesel, and household medicines. Ko Win Kyi and his family have a steady stream of income throughout the year, relieving the pressure to sell harvest right away, while many other farmers cannot afford to wait. The substantial income from his fish farm has also enabled him to rebuild his house into a two-storied brick home with a zinc roof.

He takes pride in maintaining his family's legacy of farming, though he believes farming alone does not bring the prosperity he desires for his children. He inherited five acres of farmland, and over seventeen years has purchased another 15 acres. His image as a successful farmer has made him the go-to for farming advice in his village—about two years ago, he was approached to become the village fertiliser agent. He has pioneered new techniques in the past; for example, he adopted broadcasting in the wake of a dwindling

labour force (contrary to the traditional, labour-intensive transplanting). In order to broadcast, he figured out the appropriate paddy variety, the required amounts of seeds and fertiliser, how to control water in the field, and the timing to start growing. After seeing his success for two consecutive seasons, other farmers followed suit.

He plans to buy a light truck after the black gram harvest, if the yield is good and market price is high. He can buy it cash-down and both use it for his own farm to transport his family and rent to other villagers. However, past experiences have made him cautious of the uncertainties of yield and market price. Last year, he was able to reap only one third of his usual yield due to an intense rodent infestation. From poisoning to trapping, he tried numerous ways to wipe out the rat population, to no avail. Another similar harvest combined with a sharp fall in price could drive him into debt, as could a single bad year in fish farming due to flooding (the impact being a significant loss of investment).

He keeps abreast of politics and hopes the election results will perpetuate market stability for paddy and black gram. He worries that more extreme weather and persistent flooding will affect his fish farms in future years. Despite his risks, he is confident his diversified income will ensure his family's resilience. When he is no longer able, his daughter will take over the farm, with his son remaining in Yangon.

Income	Machinery & Labour	Paddy/Rice Market Awareness	Access to credit	Basis for Choosing Variety to Grow
High	<ul style="list-style-type: none"> – Tractor, harvester, engine pump – Mechanised. Only hires a few labourers. 	High—knows millers, brokers, price movement, quality and price relation, market demands for varieties	<ul style="list-style-type: none"> – MADB – Takes loans to invest – Can buy inputs on credit – Maintains close relationship with informal lenders and can get loans at a reasonable rate – Can take out cash in advance from millers without interest – Lends money to other farmers 	<ul style="list-style-type: none"> – Market – Yield – ROI

Archetype

02



THE COMMON SMALLHOLDER

Land Ownership	Income Diversification	Outlook/ World View	Biggest Challenge	Capital Need/ Loan types
5 acres of dam-irrigated field <div><div></div><div></div><div></div><div></div><div></div></div>	<div><div>- Monsoon paddy</div><div>- Summer paddy (sesame)</div><div>- Weaving</div><div>- Adult children working on neighbouring farms</div></div>	2-3 years <div><div></div><div></div><div></div></div>	Dependent on family	Small farm-equipment loan

Daw Shwe, 56

Shwebo

Family:

Widow with five grown children helping on the family farm; three sons also work on other farms as day labourers, and two daughters weave at home and go to Shan State twice a year for seasonal farm work.

Education:

5th grade

“I don’t want anything to go to waste from our small plot of land. Every grain counts.”

Daw Shwe farms five acres of land, on which she usually grows both monsoon and summer paddy. She saw a bit more income than usual this year, as she was directed to grow sesame in response to the government’s rationing of water in her area (making paddy-growing in the summer impossible). Though she brought in only 1,100,000 kyat from farming last year, she was able to stay out of debt due to her meticulous management of her land and frugal lifestyle. With a slow and steady mind set, she makes her decisions cautiously.

She owns a pair of oxen for ploughing and transportation. For summer paddy, she often borrows her brother’s power tiller after he finishes using it on his own field. Although she understands the usefulness and efficiency of a power tiller, she is hesitant to buy one on credit. As her five children work on the farm, she does not usually hire extra labourers except for harvesting, while many of her neighbour farmers are forced to mechanise due to the labour shortage in the village. While she herself is hesitant to take on loans besides those offered by MADB, she keeps fifty baskets of surplus paddy, which she sometimes lends to villagers at eight percent monthly interest.

Shwebo is known for Shwebo Paw San rice, which commands a premium price across Myanmar (see Case Study: Shwebo Paw San). Taking advantage of the popularity, Daw Shwe grows it every monsoon.

She usually consults with other farmers when she sees pests in the field; however, she always carries a bit of skepticism. For her, seeing is believing. She prefers to wait for evidence on others’ farms before trying a new crop or technique. Having farmed during the Socialist era, she is conscious of keeping a consistent and predictable stream of yield coming each year. Similarly, she does not trust rice millers or fertiliser shops in town. Before she sells her harvest, she calls about five brokers to compare paddy prices.

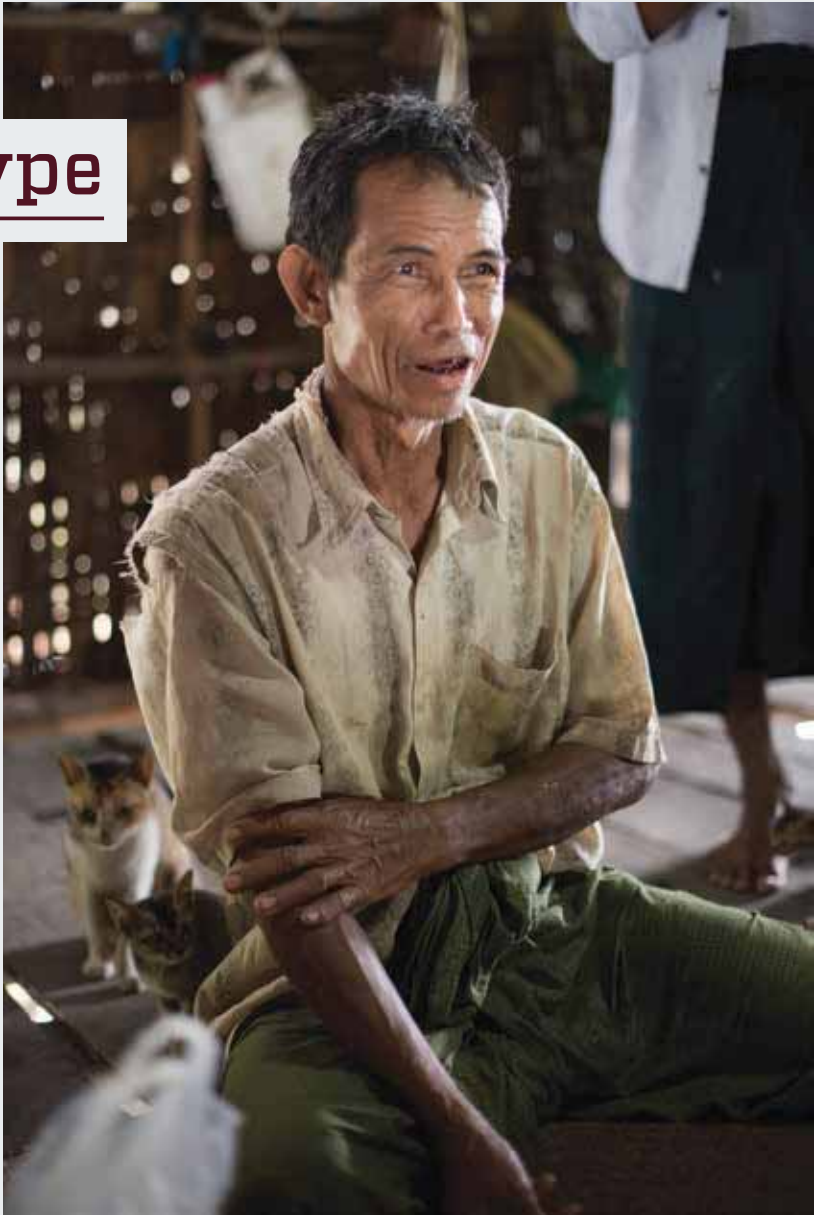
Although she is content with her life as a farmer, she wants a better life for her children. However, her small amount of land will not divide up well amongst them, and she thinks they’ll end up working on others’ farms as labourers or work as weavers when they want to start their own families. Every morning, she prays to Buddha for good health and good weather because they are her greatest concerns in life. She is aware that she has no preventative measures in place in case of unexpected shocks such as illness, pest outbreaks, and natural disasters. Despite all of this, the past seven years’ popularity of Shwebo Paw San makes her confident that everything will go well in the next five years.

“We don’t usually hire extra labourers other than planting and harvesting. My daughters do everything”.
[SHB-IND-MO4]

Income	Machinery & Labour	Paddy/Rice Market Awareness	Access to credit	Basis for Choosing Variety to Grow
Low but not in debt	<ul style="list-style-type: none"> – 2 bullocks – Borrows power tiller from brother – 5 adult children do growing and harvesting. Hires a few labourers during harvest. 	Medium—knows market price during harvesting, prefers working with broker, is reluctant to deal directly with the mill.	<ul style="list-style-type: none"> – MADB – Not in debt – Has a few savings in gold – Gives loans sometimes in paddy (her surplus harvest) – Buy inputs on credit at 2% monthly interest 	<ul style="list-style-type: none"> – Yield – Market – What others grow

Archetype

03



DOWNWARD SPIRAL FARMER

Land Ownership	Income Diversification	Outlook/ World View	Biggest Challenge	Capital Need/ Loan types
10 acres of dam-irrigated field (used to own 20 acres) <div><div></div></div>	<div><div>- Monsoon paddy</div><div>- Summer paddy</div><div>- Adult children working in Yangon</div></div>	6 months <div><div></div></div>	<div><div>- Perpetually in debt</div><div>- Risk of getting left behind</div></div>	Health insurance for his wife

U Hla Sein, 52 Pyay

“Don’t try out a new thing.
You’ll end up losing your ox.”

Family:

Married with two sons working as construction workers and two daughters at a garment factory in Yangon

Education:

No school

A farmer plagued with troubles, U Hla Sein worries about his crops, his sick wife, and his four grown children who are working in a nearby township. Three years ago, there was a severe outbreak of stem borers, which destroyed the majority of his crop. In the following year, his wife fell ill. Struggling to pay back compounding debt from the failed harvest and expensive medical bills, he had to sell off eight acres of land. Like other farmers in his village, two acres of his land were also taken by Myanmar Electric Power Company in the late-1980s in order to construct a power transmission plant.

Despite his woes, U Hla Sein is passionate about farming and has a wealth of farming knowledge passed down by his parents and grandparents. He uses this traditional wisdom to improve yield and maintain soil quality in his fields. Every other year, he takes a season off from planting to let the soil “rest”, and rarely grows the same variety more than twice to expose the soil to diverse paddy types. He is quite conservative and usually the last in the village to adopt a new technique or variety—although he regularly attends meetings and workshop held by Farm Extension Services and the promotional events by agrochemical companies. Because he is illiterate, he relies on word of mouth and the radio for his information.

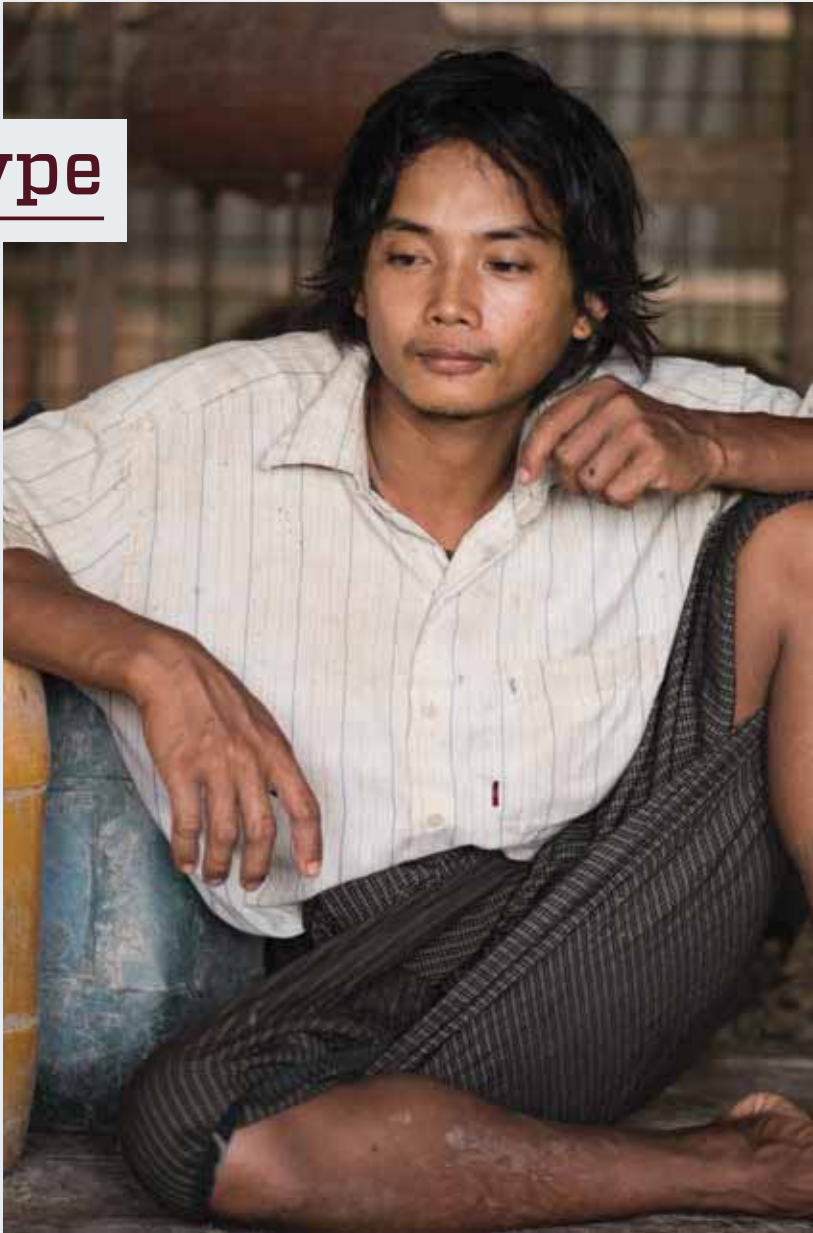
He depends on brokers to sell his harvest, and is not aware of price movement and market conditions beyond his village. The pressure to pay interest and debt has always forced him to sell his paddy pre-harvest or immediately after harvest. He is both unable to sell at a more optimal time and unaware of what doing so would entail.

Remittances from his children have helped him slowly repay his farm debt. He hopes there will be more jobs in Pyay, a nearby town, so that his children can move back closer to home. He is not sure who will take over his farm. He is living in constant fear of having to sell off more of his land or of it being taken again for another municipal project. Though he has made it through several tough years, he expects his poor luck to continue.

Income	Machinery & Labour	Paddy/Rice Market Awareness	Access to credit	Basis for Choosing Variety to Grow
Low, deeply in debt after a recent health issue	<ul style="list-style-type: none"> – Power tiller – Solely relies on hired labourers because no family members to help him farm 	Low—rush to sell after harvest, unaware of market price in town, prefers working with broker, has no contact with millers.	<ul style="list-style-type: none"> – MADB – Heavily in debt – Informal loans at 8% monthly interest – Buy inputs on credit—he doesn’t know how much exactly he’s being charged for interest 	<ul style="list-style-type: none"> – Pest/weather – Yield – What others grow

Archetype

04



CURIOUS FARMER

Land Ownership	Income Diversification	Outlook/ World View	Biggest Challenge	Capital Need/ Loan types
8 acres of land in favourable rain-fed area 	<ul style="list-style-type: none">- Monsoon paddy- Vegetables (gourd and betel leaves)- Village agent for a chemical company- Owns truck, is a village transporter	5 Years 	<ul style="list-style-type: none">- Lack of capital to expand his income options- Lack of family labour to help him in farming	Non-farm loan for business expansion

Ko Yar Zar Myint, 28 Danubyu

“I know that I can’t get rich
by just being a farmer.”

Family:

Single with family obligations to take care of his mother and alcoholic father, and financially support a younger brother who is studying engineering at the Institute of Technology

Education:

University degree

As soon as he graduated from college with a bachelor’s degree, Ko Yar Zar decided to return to his village to work on his parents’ eight acres. Although he envies his friends with white-collar jobs, he takes tremendous pride in supporting his younger brother, an engineering student at the Institute of Technology, and he aspires to become financially stable and create a better life for his family. His articulate nature and good reputation made it natural for him to become a youth leader in the community. Nowadays, educated youth rarely come back to the village after graduating from universities, let alone taking on back-breaking farming.

He prefers to grow at least three varieties of paddy on his field to hedge against price fluctuation of any specific variety. He tries to predict the market condition for the next year but acknowledges that his predictions may be wrong, as they are based on information from a previous year. To further hedge and diversify his income, he grows vegetables and betel leaf on two of the family’s acres. After saving up for three years, he purchased a light truck to transport people and goods from his village to a nearby town. Thanks to his keen business acumen, he manages his income and expenses

proactively, expands his personal network, and looks for ways to attain more financial stability. Though he loves farming, he is a realist, with a willingness to sell off the land and embark on a new venture if things do not remain profitable. He could imagine staying in farming as he diversifies, if it were to maintain his interest with a maturing market to match his maturing sensibilities. He is curious about new technologies and trends. In his free time, Yar Zar likes to browse Facebook for news and to post comments on farmer groups. When visitors come to his village, he enjoys talking to them because they bring information and knowledge from beyond his village.

“In the long run, I want to start trading. Perhaps related to agriculture. I am not sure yet. I know that I can’t get rich by just being a farmer. For farmers to be successful, we need farm technology and predictable market. I only get income from paddy every four months but I need to spend money daily. That’s why I also grow vegetables and betel leaves. One acre of gourds in the backyard is enough to cover for the household expenses”.

[DNU-IND-M07]

Income	Machinery & Labour	Paddy/Rice Market Awareness	Access to credit	Basis for Choosing Variety to Grow
Medium	<ul style="list-style-type: none"> – Power tiller – Uses power tiller to prepare land together with a friend (they take turns helping each other) – Rents combine harvester 	Medium—has broker friends, knows price movement, market demands for varieties	<ul style="list-style-type: none"> – MADB – In debt, but a manageable amount – Informal loan at 3% monthly interest with gold collateral (his mother’s) 	<ul style="list-style-type: none"> – Market – Appropriateness – Yield

	Farmer Archetype 01 Influencer Farmer	Farmer Archetype 02 Common Smallholder Farmer
Land Ownership	20 acres of rain-fed fields, partially in seasonal-submerged area	5 acres of dam-irrigated field
Income Diversification	<ul style="list-style-type: none"> – Monsoon paddy – Summer black gram – Fish – Duck – Pigs – Shop 	<ul style="list-style-type: none"> – Monsoon paddy – Summer paddy (sesame) – Weaving – Adult children working on neighbouring farms
Outlook/World View	10 years	Dependent on family
Biggest Challenge	<ul style="list-style-type: none"> – High investment but no preventative measures for natural disaster – Subject to charlatans 	Dependent on family
Capital Need /Loan types	15-month loan for fish firm	Small farm-equipment loan
Income	High	Low but not in debt
Farm Machinery & Labour	<ul style="list-style-type: none"> – Tractor, harvester, engine pump – Mechanised. Only hires a few labourers. 	<ul style="list-style-type: none"> – 2 bullocks – Borrows power tiller from brother – 5 adult children do growing and harvesting. Hires a few labourers during harvest.
Paddy/Rice Market Awareness	High—knows millers, brokers, price movement, quality and price relation, market demands for varieties	Medium—knows market price during harvesting, prefers working with broker, is reluctant to deal directly with the mill
Access to credit	<ul style="list-style-type: none"> – MADB – Takes loans to invest – Can buy inputs on credit – Maintains close relationship with informal lenders and can get loans at a reasonable rate – Can take out cash in advance from millers without interest – Lends money to other farmers 	<ul style="list-style-type: none"> – MADB – Not in debt – Has a few savings in gold – Gives loans sometimes in paddy (her surplus harvest) – Buy inputs on credit at 2% monthly interest
Basis for Choosing Variety to Grow	<ul style="list-style-type: none"> – Market – Yield – ROI 	<ul style="list-style-type: none"> – Yield – Market – What others grow

Farmer Archetype 03 Downward Spiral Farmer

10 acres of dam-irrigated field
(used to own 20 acres)

- Monsoon paddy
- Summer paddy
- Adult children working in Yangon

6 months

- Perpetually in debt
- Risk of getting left behind

Health insurance
for his wife

Low, deeply in debt after
a recent health issue

- Power tiller
- Solely relies on hired labourers because no family members to help him farm

Low—rush to sell after harvest, unaware of market price in town, prefers working with broker, has no contact with millers.

- MADB
- Heavily in debt
- Informal loans at 8% monthly interest
- Buy inputs on credit—he doesn't know how much exactly he's being charged for interest

- Pest/weather
- Yield
- What others grow

Farmer Archetype 04 Curious Farmer

8 acres of land in favourable
rain-fed area

- Monsoon paddy
- Vegetables (gourd and betel leaves)
- Village agent for a chemical company
- Owns truck, is a village transporter

5 Years

- Lack of capital to expand his income options
- Lack of family labour to help him in farming

Non-farm loan for business expansion

Medium

- Power tiller
- Uses power tiller to prepare land together with a friend (they take turns helping each other)
- Rents combine harvester

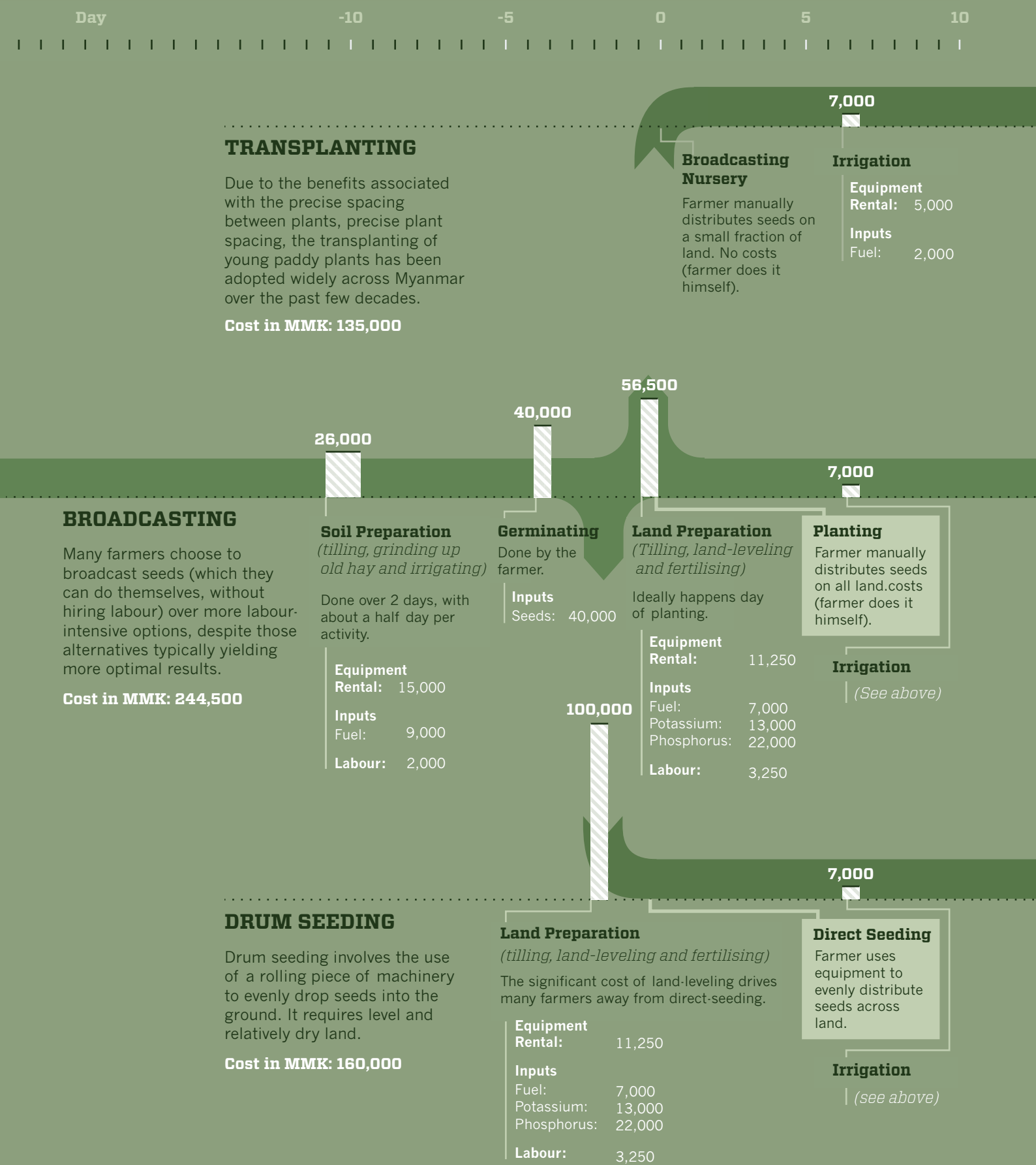
Medium—has broker friends, knows price movement, market demands for varieties

- MADB
- In debt, but a manageable amount
- Informal loan at 3% monthly interest with gold collateral (his mother's)

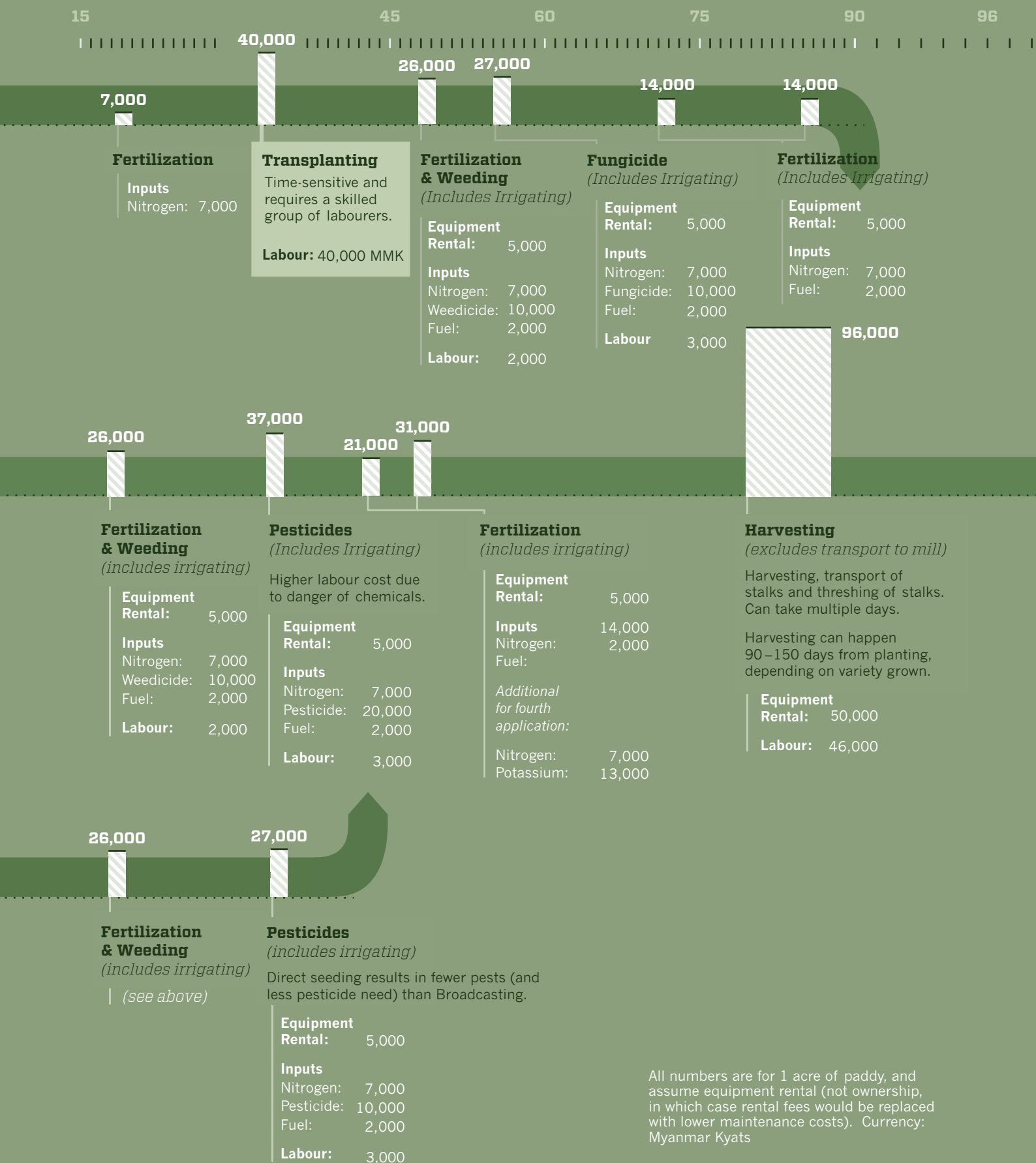
- Market
- Appropriateness
- Yield

Figure 1.02

Three Paddy Planting Techniques



What does it take to grow an acre of paddy in Myanmar? Three different planting methods are detailed below. Different planting techniques attract different pests and diseases, and require different inputs and labour at different times.



Farming Practice: Inputs & Techniques

From land preparation to drying grain for sale, the following pages detail farming practices, including the cost and labour required to grow a paddy crop and the challenges farmers face throughout the season.

Inputs

Inputs are the farmers largest expense. They include seeds, fertilisers, pesticides, labour, and any other treatments or material that contribute to their crops and their growth. The MOAI has recommended fourteen Good Agricultural Practices (GAP) that farmers should follow. In reality, these practices are not exercised at the village level due to technical challenges the farmers face and lack of compatibility with existing/ already adopted farming practices.

Techniques

Across Myanmar, we observed variations in farmers' techniques in growing paddy. We also observed that despite a lack of modern technologies, farmers are logical in the decisions they make for their farms, even when this logic is based on traditional, non-scientific knowledge.

A majority of farmers we met are still using traditional techniques, taught to them by their parents, for growing paddy. The most traditional techniques involve tilling or ploughing the land with oxen, broadcasting seeds, manually weeding, manually harvesting, manually threshing, and sun-drying grains. Many farmers are now mechanised, using mainly tillers or tractors for land preparation and threshers to separate grain from stalk. Only in the villages located right next to a road do farmers use combine harvesters to speed up the time it takes to harvest their crops.





1
Above,
A basket commonly
used to hold seed to be
broadcast or fertiliser
to be distributed

2
Above Right,
Recently transplanted
paddy

Soil Preparation & Land-Leveling

When able, farmers do take into consideration longer-term investments in their crop and land. This is especially true in soil management practices. Some farmers in Pyay, instead of growing paddy season to season, have begun changing/rotating crops or skipping a season to give the land a “rest” so that the soil can replenish lost nutrients.

“If you stick to one kind of paddy, you don’t get a good yield year over year. And if you change the crops, the soil gets used to different crops”.
[PYI-IND-M01]

Land-leveling

Land-leveling is necessary for all paddy farming. The more level the land, the more evenly seeds can be planted, watered and fertilised, hence the more evenly they will grow. Basic land-leveling is done by farm animals pulling large pieces of wood or pipe across the land; more sophisticated land-leveling employs heavy, expensive equipment. Land-leveling most benefits farmers when done seasonally, however most do so less frequently.

Tilling & Soil Preparation

To soften the land for planting (and often to mix in/incorporate fertilisers), tilling is often done multiple times prior to planting. Methods vary from manual tilling to using more expensive riding tractors.



Seeds

Seed is the most fundamental and critical input for paddy farmers. Sowing good-quality seeds leads to high yields and superior-quality harvests. According to the International Rice Research Institute (IRRI) [REF 76], the following factors are used to determine quality of rice seeds:

Purity: Good seed is pure, from a single variety, and not contaminated by weed seeds, other varieties, stones, dirt or twigs
Germination percentage: good seeds have a more than 80% germination rate.

Discoloration: Discoloured seeds caused by fungi, bacteria, and environmental conditions fail to produce vigorous seedlings.

Seed viability: Viable seeds that produce early and are uniform stand during germination and seedling emergence.

Moisture content: The amount of water in the rice grain influences the life and vigour of the seed; the amount of moisture should be less than 14%.







OPPORTUNITY AREA

Land-Levelling /Management

Current methods utilised for land-levelling are either wholly home-grown or part of a larger land modernisation effort. Accessible and practical means of land-levelling for the majority of farmers have not yet been meaningfully addressed. Land-levelling has many positive impacts on the farmer's land (such as more equal watering, fertiliser distribution, more even growth of plants, and easy of use of machinery), whether applied by the farmer or a third party. Both initial land-levelling and its maintenance are opportunities for new products and services, as farmers may choose to either manage it themselves or subscribe to a maintenance program. Additionally, auxiliary services, products, and processes (such as canal-/irrigation-trough maintenance and direct seeding) can begin to be offered after land-levelling is achieved.



FIGURE 1.03
RICE VARIETIES BY REGION

VARIETY/ REGION	LOW-END	MEDIUM-END	HIGH-END
Shwebo	747 Pale Thwe Nway Thwe	Manaw Thukha Schwe War Tun	Paw San
Pyay	Pale Thwe Sin Thwe Let	Kyaw Zaya Au Ma Tha Lay	Ayar Min
Danybyu	Pale Thwe Sin Thukha	Tun Pu Hmawbi II	Thee Htet Yin

Varieties in Myanmar

According to MOAI, Emata, Ngasein, Letywezin, Meedon, and Byat are the five varietal groups classified by grain length and ratio of length and breadth, and 1,074 varieties are listed as local varieties. (World Bank 2014) Farmers generally understand that there are two varieties of rice seeds: seasonal and age. For seasonal varieties, the months at which the paddy crop is mature and is ready to be harvested are consistent. The precise planting date does not matter as much as long as the seed is planted approximately three months from the appropriate harvest date, it will reach maturation. For example, a variety that matures in November will be ready for harvest in November whether planted in early August or early September. For age-wise varieties, the paddy crop is mature and ready to be harvested only when it is a certain number of

days old. If the variety is a 120-day-old variety, the crop is ready in October if the farmer plants it in June, and the crop is ready in December if the farmer plants it in August.

The paddy seeds that Myanmar farmers are using are mainly traditional or local varieties. Sometimes, these varieties are hybridised together to get desirable qualities, which include not only the physical characteristics but also the market price and the timing of the harvest. The varieties the team came across during the study are shown in the table above.

Deciding what to grow

At the beginning of every crop season, farmers must decide which of the available crop varieties to grow. They invest their time, effort, and money in the hope that the variety

they have selected will be successful and provide a high return. The following factors impact farmers' decision-making process:

Crop Season: Some seed varieties can only be harvested in a particular month. Also, some seed varieties can only be grown in certain weather and environmental conditions. In Shwebo, Paw San is strictly a monsoon variety, while 747 is strictly a summer variety. This varies regionally, as some varieties most-suited for summer paddy in the delta are better-suited for monsoon paddy in the Dry Zone or other areas (and vice versa).

Duration: Different seed varieties have different lifespans. Farmers often prefer a shorter lifespan, which allows for a more timely harvest. In the case of summer paddy, a short lifespan can help dodge the potential of an early rain coming and wetting the paddy prior to harvest. However, farmers make different decisions regarding duration when pests are present (we will discuss later the relationship between paddy growth and pest infestation) or when a farmer is not in control of planting time (due to irrigation or other factors).

Input Cost: Farmers also have to calculate their return on investment. Paddy varieties have different input needs, and hence the farmers always have to judge input vs ROI. For example, the newly introduced government variety, Pale Thwe, requires skilled and hence more expensive labourers to transplant it. Some varieties require more fertilisation than others, or other inputs.

Economic Return (Yield x Market Price): Seed varieties have different yield amounts (measured in baskets of paddy per acre) and their own variation in market prices. For example, Paw San has low grain yields but a high market price, while 747 has high grain yields but low market price. For some

farmers, a guaranteed market for their paddy at the time of seed purchase is the driving economic force. In Danubyu, where there is contract farming, many farmers happily grow Hmawbi II and Sin Thwe Latt varieties, as there is a company that regularly buys those varieties and guarantees a consistent market price. The less farmers are connected to a particular market or market price, the more the yield plays a role in their decision making. We encountered farmers who grew a variety after hearing about its high yield, without an understanding of whether there would be a market for the grain at harvest time.

Resilience to Problems: Even when farmers have a favourable environment for higher-return varieties, they pay attention to a variety's propensity for pests, disease, and rodent problems. In Pyay, we visited a village where farmers have regular access to irrigation from a nearby dam, and the soil type is so good they do not need to spend much in fertilisers. However, rodents have been a big problem, and hence the farmers do not dare grow a variety which is different in harvest time from those of other farmers, lest their crop be the "first to fruit" and first to be feasted on by rodents.

Tacit Knowledge: Some farmers are keen to experiment with varieties, while others are afraid to venture out. The latter, in particular, are afraid of loss of crops or yield as a result of trying something unfamiliar. In a Shwebo village that is still rainfed (versus the many Shwebo villages which are irrigated), all grow Manaw Thukha because of a generational history that provides them the knowledge of how to grow it given their environmental conditions. The variety has also proven to be somewhat drought-resistant and has a good-enough market price.

Personal Taste Preference: Some farmers like to grow the varieties which are “sar-kaung-del”, meaning “delicious”. Many farmers save up the paddy that they grow for their own consumption.

Other Factors: Farmers also mentioned availability of seed, appropriateness for region, and ease of farming (namely, toughness of stalk to harvest, ease of threshing seeds) as variables. Some farmers buy seed year over year from the same growers or simply grow the same variety they have grown in previous years, using seed grown themselves to avoid cost.

Notably, market demand does not drive the variety chosen as often as other factors, the exception being in cases where farmers grow specifically for a particular buyer (e.g., a contract farming organisation) or for export (e.g., the 747 variety grown in Shwebo is entirely grown for export to China). Also, it is important to remember that not all varieties are prevalent in all regions. Farmers’ choices are often limited to what they have been exposed to in their region, though they are sometimes influenced by recommendations made by the government and introduction of new varieties into their region.





Above,
A government farm
for multiplying seed

Ways to Get Seeds

A majority of farmers reuse or regrow their seeds, but there are other ways to source their preferred varieties. When a farmer regrows his own seeds, different varieties are unintentionally mixed up, giving rise to mixed grains or a new hybrid variety from cross-pollination. Grains from different varieties demand a lower market price.

There are numerous challenges and complications to obtaining seed.

Good-quality seed must be grown, harvested, and processed correctly. In Myanmar, there is a national seed certification system, and the certified rice seeds are mainly produced by the Department of Agriculture (DOA) under the MOAI. IRRI has been working with the Myanmar government in developing new hybrid seeds suitable for climate conditions in Myanmar. However, IRRI is only responsible for R&D of the seeds. If IRRI is confident in the potential benefits of a new seed, IRRI will then recommend the seed to the National Seed Committee. If the committee accepts the recommendation, the seed's name is changed from a scientific name to a Myanmar name (see Etymology of a Seed), and the seed is grown at the government farms for mass usage and distributed.

Figure 1.04
WAYS TO GET SEEDS

GOVERNMENT/MOAI

The MOAI has seed-growing farmers on its staff who are responsible for multiplying seed for sale to their respective townships.

**SOURCE
OF SEED**

MOAI varieties, often created in collaboration with IRRI

COST

7,000/basket



- + Have land, process, and distribution channel
- + Low-cost (relative to private seeds)
- + Quality controlled
- + Techniques for planting specific varieties available



- Constant shortage vs. need by farmers
- Only seed varieties promoted by MOAI are sold
- New varieties can sometimes be challenging to grow or require special care
- Farmers have to leave the village to purchase
- Hybrid varieties propagated are notorious for having no market/ being unsellable

PRIVATE	VILLAGE	SELF-GROWING/REUSE
Companies like Gold Delta contract seed growers to multiply varieties that are part of their seed sale/paddy purchase scheme.	Most villages have at least one individual who is specially known for growing seeds for sale.	It is also common for farmers to grow their own seed, especially as a cost-savings measure. Farmers who do this will grow a specific ratio of seed to paddy for sale, which depends on how much land they have and the costs they incur to mill their rice.
Domestic and internationally-originated seeds—sometimes hybrids and GMOs	Government/MOAI seed growers, private companies, or other farmers	Government/MOAI seed growers, private companies, or other farmers or own seeds from previous harvest
10,000–12,000/basket	10,000–15,000/basket	N/A
<ul style="list-style-type: none"> + Have access to a greater variety of seeds than MOAI + Distribution channels (agent) 	<ul style="list-style-type: none"> + Accessible—farmers don't have to leave the village to purchase + Additional stream of revenue for seed-growing farmers 	<ul style="list-style-type: none"> + No need for farmers to purchase seed/can save or reinvest capital + Farmers grow what they are comfortable with (varieties they have previously grown)
<ul style="list-style-type: none"> – Priced higher than MOAI, often out of reach for farmers – New varieties can sometimes be challenging to grow or require special care – By contract, additional care, handling, and cost for growers (e.g., weeding required multiple times/season) – Farmers have to leave the village to purchase 	<ul style="list-style-type: none"> – No quality guarantee, risk of inconsistency – Not always grown in response to market need (may be less favourable variety) – Reputation of grower limited to village/village tract (no way to vet) 	<ul style="list-style-type: none"> – No quality guarantee, risk of inconsistency – Impurities and genetic issues (including propensities to pests) get passed on and sometimes exacerbated – Seed quality deteriorates over time

Figure 1.05

Registered Seed Cycle

Exemplary of the disconnect between the MOAI and Myanmar farmers is the design of the registered seed cycle, its goal is to provide farmers with high-quality seed on a “regular” basis; our team found the realities of the cycle to be quite different.

1 SEND SEED

MOAI sends seed varieties to the country's four government seed growers.

2 SEED GROWN

Government seed growers grow seed varieties that are best for that season (e.g., they grow a variety that performs well in their region during monsoon).

We met with a government seed grower, who described that, despite having 90 acres to grow seed, the government only lets him produce seeds on a small portion of it (producing only enough for 150 acres of farm). He said the farmers need more seed, however the government land is instead being used by a private company with ties to the ministry.

3 SEED SOLD

Output of Government Seed growers is Registered Seed, which is sold to farmers in the townships they serve in January (once seed is ready/dried).

3
YEAR CYCLE

Intent

4 SAVE SEED

Farmers save the seeds until monsoon, and Village seed growers plant the seed and grow to multiply for the following year.

5 REPLANT CERTIFIED SEED

Farmers and village Seed growers have time to harvest and dry their seed to resell back to other farmers in their village for the subsequent 3 monsoon seasons. The intent is for Registered Seeds to circulate amongst the farmers for 3 years - being grown by Village Seed growers and farmers and recycled as seed 1 season per year. On the fourth year, the farmers and growers return to the MOAI to purchase new seed. The seed circulated in the village / amongst farmers is referred to as Certified Seed for the 3 years after it is purchased as Registered Seed.

1
YEAR CYCLE

Reality

6 PLANT AT ONCE

Farmers plant the seeds acquired from the MOAI immediately as Summer Paddy in order to generate income.

7 SELL IT ALL

An increase in demand by mills for higher-quality first-generation paddy (seeds one season out from Registered Seeds) has created an impetus for farmers to sell all of their paddy after the first harvest, saving none of it as seed without recirculating any into the village / their own farm.

8 MORE DEMAND

Farmers are then returning season after season for new Registered Seeds from the MOAI, rather than every 3 years. With an already stressed seed supply, it is impossible for the MOAI (under current practices) to meet this demand for seed.



Above,
A day labourer
transplants
young paddy
plants individually,
by hand

After a period of three years, the quality of a seed that has been continuously reproduced by a farmer or village seed grower begins to diminish, with any negative attributes of the seed (such as propensity to pests) often being exacerbated. Hence, it is critical that the seed cycle regularly introduces fresh seeds. Farmers' awareness of this need to refresh their seeds is varied; many in Pyay were able to associate continuous reuse of seed with problems they were facing in their crops, such as mixed grain and increased prevalence of mutations or unfavourable physical attributes in the plant or grain.

Although there is a national seed certification system to encourage the circulation of registered seeds among farmers, one of the challenges with providing quality seed in a timely and appropriate manner by individual farmers is lack of time and/or machines to accelerate

the process. For example, village seed growers must have enough time for the seed to dry prior to selling it for planting in the following season. However, it takes one to two months for seed circulated as Certified Seed to dry without a dryer machine. This further exacerbates the practice of selling paddy "grains" to mills rather than processing and recirculating them as "seeds" into the village (as described in Framework 27).

"We can't develop like other countries because there's not enough seed for farmers. The department can't grow seed because the seeds [are] being sold to the companies".

[PYI-IND-M15, a seed grower]

“We can’t develop like other countries because there’s not enough seed for farmers. The department can’t grow seed because the seeds [are] being sold to the companies.”

– Government Seed Grower, Pyay [PYI-IND-M15]

Abundance of Varieties, Shortage of Quality

While an abundance of seed varieties exists in Myanmar, there is a serious shortage of good-quality seeds. Without effective quality control, a nation-wide varietal evaluation system, and accessible information about each variety, the excessive diversity is a curse rather than a blessing for the Myanmar rice industry. It not only complicates aggregation along the value chain but confuses farmers regarding selection of appropriate varieties, whether their concerns be about resistance to weather and pests, higher yield, or a good and consistent market price. Most farmers simply cannot buy good-quality seeds, even if they have information on appropriate varieties for their specific needs and can afford to buy them, due to the limited supply of public seed production programs. Though growing slowly, the private seed industry is almost non-existent.

However, the lack of a good-quality seed supply does not seem to bother most farmers we met. They use their own “grains” from previous harvest as “seeds” or buy seeds grown by other farmers from nearby villages. For them, it is a familiar farming practice that has been passed down for generations. The words “grain” (for eating) and “seed” (for growing) are synonymous for an average farmer.

“I use my own seeds. I don’t buy from others.”
[SHB-IND-F03]

While seed-growing farmers know the importance of purity and consistent coloration to determine the quality of seeds, concepts such as germination percentage, seed viability, and moisture content are alien to them. Out of all research locations, Shwebo farmers are most particular about the origin and purity of seeds, especially for high-quality varieties like Shwebo Paw San. We learned that farmers are willing to pay a premium (3-4x) on seeds from Thee Lone, the original village that pioneered the Paw San variety in the region.

“Since these are good quality seeds, there are no red spots”. [SHB-IND-COU04, village seed grower]

Dis— connect of Hybrid Rice Varieties

It was no surprise to us to hear stories of hardship from farmers who had attempted to grow the new MOAI-supported hybrid seed variety Pa-le Thwe. A “darling” of the minister, the variety is notorious for being impractical to grow with existing farming practices and quite labour-intensive. The hybrid seeds are not only costly but also require a higher rate of fertiliser use. Many farmers believe that extension services staff were forced to encourage villagers to buy the seed, based on the minister’s preference.

“The harvesting is good (because it’s early), yield is good, but it’s too labour-intensive and the sparrows and rats feed on it because it comes so early”.
[PYI-IND-COU02]

“The government recommended a new seed variety, which requires very specific practices. You lose when you grow this variety, even if the yield is higher, because the seed cost is higher and you have to pay more for labour because of the care needed”. [PYI-IND-M02]

“It’s impossible for what the villagers practice on the field to match what the government practices.”

– Government Seed Grower [PYI-IND-M15]

In all three locations we visited, we encountered a number of farmers who tested out a Vietnamese hybrid variety and were deeply disappointed by the results. They simply called it “Vietnamese variety”, being unaware of the origin or actual varietal name.

“I tried the Vietnamese rice but will not grow it again. There was no market, so I had a hard time selling it. The seeds are too small and light, so they get blown by the wind and need special care at harvest...The seeds have to go through the thresher twice, because they are so light that the machine thinks they are trash the first time around...” [PYI-IND-M08].

“The Vietnamese rice is hard to harvest but the yield is good. I tried to farm it for a year but stopped because the plant is super strong and hard to cut—very tiring for labourers”. [SHB-IND-M15]





OPPORTUNITY AREA

Availability of Affordable, Quality Seed

The shortage of quality seed (both from public and private institutions) and a dearth of knowledge at the basic farmer's level regarding the importance of seed quality are contributing to an inconsistency in farming practices and in the output of quality, accountable product from Myanmar's paddy farmers. Current seed produced by private companies is limited and therefore significantly higher in cost, rendering it unattractive to farmers who may not have access to the more affordable government-reproduced seed (save for instances, such as with Gold Delta in Danubyu, where purchasing seed comes with a guaranteed market price come harvest time). The delta between professional, accountable, and quality-controlled seed reproduction and distribution and traditional means of recirculating seed amongst villagers and within an individual farmer's own farm has yet to be taken advantage of.



Vignette:

What is the Difference between a Seed Grower and a Regular Paddy Farmer?

Though the overall practice of growing paddy does not change between paddy grown for consumption and paddy grown for seed, seed growing requires meticulous attention to detail and careful consideration of inputs. Reputation of seed is quite important for seed growers, and a grower is judged on his attention to detail regarding the purity of his seeds (lack of mixed variety) and seed quality.

“With seed growing, you have to be much more precise—with regular paddy you can just broadcast. You want as much consistency as possible in seed growing”. [DNU-IND-M14]

Seed growers face the same challenges as all paddy farmers. Even a government seed grower we interviewed described challenges he had with water management in the wake of a late monsoon season. In his case, there was a direct correlation between his ability to grow and prepare seed in a timely manner and the ability of farmers in the region he serves to plant on time.

Seed-growing Practices

Planting Technique: Giving the Plants Air

Consistent growth across a crop is especially important when growing seeds, as there is no milling or processing that happens after harvest and prior to planting in order to weed out poor-quality seed (save for salt-water seed selection, which is practiced by some farmers to remove poor-quality seeds). Spacing plants consistently and with more room than paddy grown for food is commonly done by growers as a measure to encourage more even growth of the plant, through even access to soil nutrients and to sunlight.

Maintaining Purity: Looking Out for Variety

While those who grow paddy to sell for milling care about the purity of their harvest (as it affects the amount they will get), purity is critical for seed growers. It is not uncommon for seed growers to regularly check their fields, plucking out or cutting irregular plants or any that appear to be a different variety from what they are multiplying.

For the same reason, seed-growing farmers must also be diligent about weed removal. Seed-grower farmers often have much higher weedicide or hired labour costs as a result.

Special Handling

U Kyaw Lin Aung, a seed grower in Shwebo, manually picks his harvest, plant by plant, in order to ensure the purity of seeds. He only picks the seeds from the top stalks, as they have fuller/ better seeds and the bottom husks are typically empty. Use of a thresher would result in both kinds being mixed together. He only trusts a group of labourers he regularly hires every year for this task because others may not take the same care in handling the harvest.

“You should go out and check your crops once a week, but I go out every day”. [DNU-IND-M14, seed grower]

Wrong Seed Grown

Reputation is critical for the long-term business of a seed grower because low-quality seeds affect paddy yield and thus income. But in one particular case, we heard about a man's brother whose labourers accidentally mislabelled monsoon seed for summer and vice versa. His own farm was affected, and everyone who purchased had paddy growing at the wrong time. However, people still purchased paddy from him the following year because they realized he'd made an honest mistake.

Seed Production by Rice Specialisation Companies (RSCs)

In Danubyu, we met several seed growers who were trained and certified by the Gold Delta Rice Specialisation Company. They produce seeds for two varieties, Hmawbi 2 and Sin Thwe Latt, for other farmers in the region. Compared to individual seed-growers in Shwebo and Pyay, these certified farmers are better equipped with the knowledge and skills necessary to produce quality seed. Such intervention by private Rice Specialized Companies has emerged out of a necessity to control purity and quality of grains for export markets, and it is appearing sporadically across the country (both in paddy and other farming practices).

"The government is trying to take forty-five of the ninety acres we are using for seed growing, but I need all ninety to produce seed for the fourteen townships I oversee". [PYI-IND-M15, government seed grower]

"I started seed production in 2011 for Gold Delta with ten acres of Sin Thwe Latt". [DNU-IND-M10, Gold Delta seed-grower]





Salt-Water Seed Selection

The seed-selection method using salt water, promoted by Proximity Designs in Bogale and Mawgyun township, has not yet been widely adopted in Myanmar, although we observed some variations of it. Properly done, farmers can effectively separate good-quality seeds (which are heavier) from poor-quality seeds (which are lighter) by immersing them in salt water. Some farmers use the method with pure water instead, as they fear they will lose more seeds, unaware that the seeds they “lose” using salt water are of bad quality. The cost of salt is also sometimes a prohibitor to proper utilisation of this technique. Some farmers soak seeds in pure water to facilitate the germination process, while others soak in salt water in the hope that the salinity will kill potential pests and diseases.





Transplanting

Due to the benefits associated with precisely spacing plants, the method of transplanting young paddy plants has been adopted widely across Myanmar over the past few decades. Farmers first broadcast seeds for a nursery farm (broadcasting entails a skilled throwing of seeds evenly across a specified plot of land). Weeks later, germinated plants are plucked and planted evenly and neatly in rows, distributed across the farmers' plots (typically by a team of female day labourers, who farmers insist are most skilled at the practice). The spacing leaves enough room for each plant to breathe in air, prevents pests and diseases, and makes weeding easier. In irrigated villages in Shwebo and Pyay, we observed that almost all farmers had adopted transplanting, although the spacing between plants varied. In Danubyu and elsewhere in the delta, however, many farmers are switching back to broadcasting from transplanting due to a shortage of labour.

Alternate Wet and Dry Method

This method of irrigation is recommended by the MOAI, though we did not observe many farmers adopting it. Often referred to as “washing the face”, this method is a water-saving technology that irrigated-rice farmers can use to reduce their water use by alternately flooding and not flooding their fields. Rather than adopting this technique, farmers are irrigating the fields and leaving the water inside for weeks. This is typically in order to suppress weeds, which may come out if the soil when exposed to sunlight. It is worth noting that lack of adoption can also be attributed to a lack of water control, especially in areas with run-down irrigation infrastructure, or uneven land or poor/inconsistent access to drainage and water to pump.



Fertilizers and Growth Agents

One of the most important elements in improving yield and maintaining soil quality, fertilisers are often the first thing to go when times are tight and capital is thin.

Right,
Farmer with
a handfull of
fertiliser

Although many farmers still prefer natural fertilisers (e.g., cow and animal manure), an increase in mechanisation has seen a corresponding decrease in cattle, rendering these fertilisers difficult to come by at the volume needed for multiple acres of land. “It’s hard to get cow dung for all of the acres that I own,” said a farmer with ten acres, who prefers to fertilise with cow manure. Even when he had fifteen cows, he was unable to produce enough (he now has eight cows). He now tries to supplement by buying from his neighbours. A cart of cow manure is 2,000 kyats, with five to ten carts required per acre to use with ploughing.

Types of fertilizers

At the basic level, a farmer needs to apply a balanced ratio of nitrogen/urea (N), phosphorous (P), and potassium (K), commonly known as NPK fertilisers, depending on the needs of their soil. (Proximity Designs 2015) Many local agrochemical companies offer fertiliser bags with different ratios of N, P, and K, calling them “compound” fertilisers. On top of the soil’s NPK ratio, there are two major types of soil problems: acidity and salinity. A farmer

also needs to apply calcium (Ca) if the soil is too acidic, and needs to apply a sulphate (S) fertiliser if the soil is too salty. Farmers rarely refer to fertilisation in this way, and instead describe the practice and fertiliser types using different language.

In farmers’ vernacular, NPK ratio is translated into three types of fertilisers, referring to the timing of application and the aspect that the fertiliser is designed to help grow or for which it maintains health. They are called “foundational” fertiliser, “for the plant” fertiliser, and “for the grain” fertiliser.

“Foundational” Fertiliser

Distributed while farmers till and plow the land, this “foundational” fertiliser prepares the soil to provide favorable conditions to plant. Farmers usually apply nitrogen/urea bags or compound fertilisers, which include all N, P and K. Applying nitrogen at this early stage of planting, however, is a waste of money because young seedlings cannot absorb nitrogen until a much later stage of growth. Some knowledgeable farmers may apply potassium bags, locally known as T-super bags or “ash” fertiliser bag. When farmers cannot afford potassium bags, they burn the previous hay and spread over the



soil to get so-called “ash” fertiliser, because ash contains a small tint of potassium. However, burning hay out in the farm may also deplete already existing nutrients in the soil. Farmers usually skip applying phosphorous in “foundational” fertilisers, despite being essential for plant growth.

In “Foundational” fertiliser administration, has the most variations in use from farmer to farmer. While some decide to add in fertilisers while they till (with preferences varying across natural fertilisers, pure phosphorous, compound fertilisers), others choose to add nothing. We observed many farmers only adding “foundational” fertiliser once a year, despite growing two seasons of crops.

“For the Plant” Fertiliser

Distributed at 15 and 45 days post-planting, this “for the plant” fertiliser helps the stock of the plant grow strong and tall. It is also thought to help the growth of different branches. Farmers typically include urea, also known locally as pearl fertiliser or “white” fertiliser, and phosphorous in this “for the plant” fertiliser. Although urea helps the growth of the plant, phosphorous should have

been added during tilling or when the plant is young because it strengthens the roots.

“For the Grain” Fertiliser

Distributed at 60 days post-planting and after the rice shoots come out of the paddy plant, “for the grain” fertiliser (typically potassium, also known locally as potash fertiliser or “black” fertiliser) supposedly promotes healthy grain growth and increases yield. In reality, however, potassium should have been added once since tilling, and it is often too late to apply potassium by the time farmers actually apply.

Applying fertilizers

Myanmar farmers are observant of what other farmers are doing. However, when it comes to fertiliser application, they “personalise” the application method. In practice, they do not know or understand the fertiliser needs specific to their soil. Oftentimes, the farmer guesses what his soil may need. Hence, the application of fertiliser per acre varies across farmers. In a Pyay village, we observed two



farmers in a single village (with adjacent tracts of land), one of whom used two bags of fertiliser per acre while the other used one bag of comparable fertiliser for every two acres. There is, however, common logic in deciding which amount and kind of fertilisers to add.

Prior Personal Success

Farmers decide the amount of fertiliser, especially “foundational” fertiliser, based on their yield from the previous season. Prior low yield is an indication of a weak soil; hence, farmers add in more fertiliser to accommodate.

Reaction to Plant Conditions

Often, farmers observe the conditions of their paddy plants and apply fertilisers, especially the “for the plant” and “for the grain” fertilisers, accordingly. These conditions include the plants appearing weak or the leaves not being green enough. Farmers will continue applying fertilisers in small amounts over a week until the plants begin to approximate the condition they desire.

Problem Prevention

Farmers draw analogies between fertilisers and human food or vitamins. Just as a strong and non-nutrient-deficient person will be resistant to disease, many farmers believe that a strong and non-fertiliser-deficient paddy plant will be resistant to pest and disease problems. In some Shwebo villages where farmers over-apply fertilisers to prevent spread of stem borers (an insect pest we will discuss later), despite there being no relation between stem borers and fertilisers. In fact, the over-application of fertilisers adds to the overall ecosystem breakdown and may in reality be contributing to the prevalence of invasive pests.

Price

Sometimes, farmers know what kind of fertilisers they need based on their soil, but are confined to the types of fertiliser they can afford. This is particularly true when farmers are forced to use compound fertilisers, due to credits acquired through the purchase of compound fertilisers and other spoken or unspoken pressures from salespeople. Compound fertilisers are sold by big agrochemical companies and come in different ratios of N, P, and K. Although the paddy plant needs the N, P, and K of compound fertilisers, it needs

1
Above,
A farmer in
Danubyu
fertilising his soil
before planting

2
Above Right,
Inputs shops
sometimes sell
smaller quanti-
ties, for farmers
who cannot afford
large bags



them separately at different stages of its life cycle. As an example, urea (N) is of no use and actually harmful for the plant if applied later, closer to harvest time. By having to use compound fertilisers inappropriately throughout the crop cycle, farmers risk low yields. Compound fertilisers come in different ratios, and hence farmers can technically pick and choose the level of separate chemical components; however, it is too complicated for them to understand and too expensive to buy different bags.

“Often farmers know that they need good fertiliser but they can’t afford it, so they use cheap, no-brand product”. [SHB-IND-COU02]

“We’ve been growing paddy so much, farmers aren’t rich enough to put in fertiliser”. [PYI-IND-M02]

Challenges with fertilizers

Farmers have difficulty comprehending the chemical complexity of fertilisers. This is amplified by the fact that many input shops carry fertilisers with no labels and/or instructions—or, worse, they carry fake fertilisers.

Though laws exist around the sale of fertilisers and require fertiliser companies to register the products they import, there is still a prevalence of unregistered and re-packaged fertilisers on the market. In one shop we visited in Pyay, multiple products from other countries were brought in and repackaged as a store brand and sold opposite brands like Awba and Golden Lion.

“No world region has been able to boost agricultural growth and tackle hunger without increasing the use of fertilisers”. (World Bank 2015)

Farmers therefore often rely on word of mouth and recommendations from each other to establish which type or brand of fertilisers to use. Sometimes, they experiment on their farms with multiple fertilisers and compare different results.

“I can only tell if a fertiliser is poor quality after one or two years. I will broadcast the fertiliser every year, and continue to use until it consistently doesn’t work. I always give it a few seasons to see if condition changes”. [SHB-IND-M06]

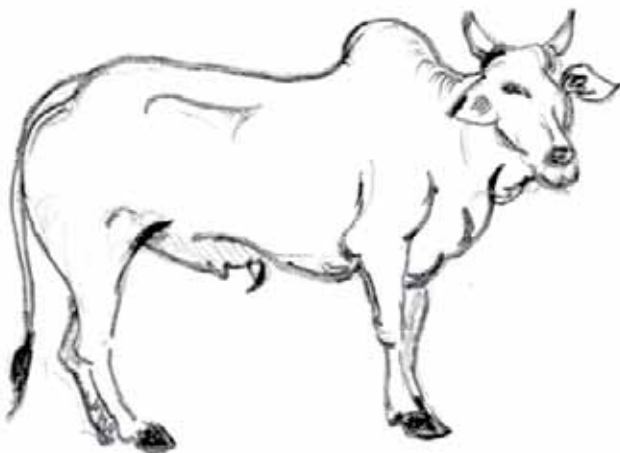
“No world region has been able to boost agricultural growth and tackle hunger without increasing the use of fertilisers.”

– World Bank, 2015

Right,
When farmers
cannot afford
potassium bags,
they burn hay to
get so-called “ash”
fertiliser. Ash
contains a small
tint of potassium

Farmers sometimes treat soil malnutrition with compound fertiliser under the assumption that it contains all of the necessary nutrients to reinstate fertility. This is problematic when the actual problem with the soil is the over-abundance of harmful materials, such as sodium bicarbonate or an excess of iron. Soil that is too acidic will appear cracked, similar to soil that is too dry; however, adding water (an intuitive move often made by farmers in response) does not remedy the acidity.

Some farmers believe that proper fertilisation also helps to manage pests, by keeping the plant optimally healthy. We did not, however, encounter farmers who understood the relationship between fertilisation and soil maintenance.







The background of the entire page is a photograph of a rice field. In the upper portion, there is a white rectangular text box. Below the text box, the image shows a muddy, uneven ground with some small green plants and scattered dry leaves. In the bottom left and right corners, there are pieces of discarded plastic waste, including a blue and white wrapper and a yellow and white wrapper.

OPPORTUNITY AREA



Soil Health /Fertilisation

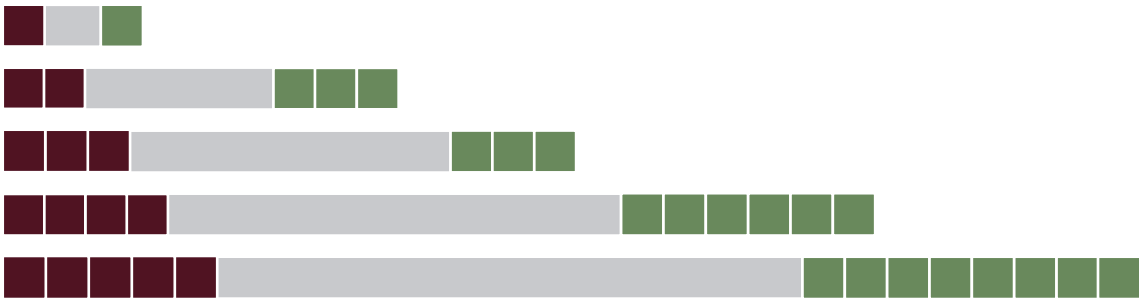
There is currently a mismatch between fertilising needs and what the farmers are applying to their fields. Accurate and accessible soil assessments paired with a fertilisation regimen and other practices has the potential to address specific deficiencies as part of the fertilisation regime. This would be combined with a programme to increase farmer literacy on soil health and maintenance.

Figure 1.06

Loss Due to Infestation

The money lost in yield and time to rebound from an infestation increase exponentially the more acreage affected.

 INFESTED ACRE	 LOSS (KYATS)	 SEASONS NEEDED TO CATCH UP
1	(172,500)	1
2	(572,500)	3
3	(972,500)	4
4	(1,372,500)	6
5	(1,772,500)	8



Coping with Pests and Diseases

Throughout the farming seasons, a farmer inevitably has to face problems related to pests and diseases. For an average farmer with five acres of farmland, these problems can set him back for at least a season for every acre that is affected, as shown in the table above.

Among the locations we visited, major problems have been pests, such as yellow stem borers, brown plant hoppers, and nematodes.

The first time a farmer has a problem, he typically does not know how to identify or describe the symptoms, nor does he know the proper treatment. As a result, he consults with an expert, like a neighbouring farmer who may have experienced this problem before, an agrochemical store staff, an agrochemical company field staff, or a government extension staff.

Often, a farmer will pluck a troubled plant from the ground and bring it carefully to the experts, as a mother would bring a sick child to the emergency room for help. Sometimes, when plucking the individual plant is irrelevant, the farmer invites the expert to come visit his or her farm for diagnosis.

Figure 1.07

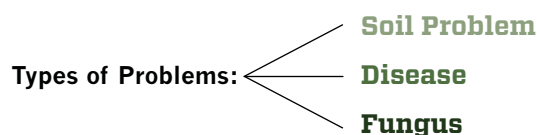
Farmers' Diagnostic Challenges

Farmers' methods of diagnosing problems with their crops are symptomatic and often visual. Changes in colour or shape of individual paddy plants or of the entire plot are indicators that something is wrong, and farmers often rely on past experience to make a diagnosis. Often, if a specific problem is unknown to the area, the farmers are unprepared, resulting in the problem sometimes going unnoticed or misdiagnosed. Treatments for each problem can vary drastically, and a misdiagnosis can even result in a treatment that will worsen the actual root cause.

Symptom-based diagnostic procedures are challenging, as there are many opportunities for confusion between problems due to symptomatic similarities. For example, a nutrient-deficiency and

disease problem may manifest in the same way per plant; similarly, indistinguishable symptoms can present themselves as both disease and pest problems. A stunted plant might be diagnosed as having a nitrogen deficiency or disease, but if an insect is found on the plant, the diagnosis can shift to pest infestation.

Even when a farmer can distinguish the symptoms of a disease from that of a pest, he cannot further diagnose the specific disease or pest. At this point, the farmer relies on his most trusted experts for diagnosis and advice, be it the salesperson at an input store, a neighbour, or an agronomist. Below are common symptoms farmers recognise as problematic, and the variety of root causes associated with them.



**SHORT PLANT,
NEW LEAVES TURN YELLOW,
OLD LEAVES TURN RUST BROWN**

Could be

Zinc Deficiency

OR

Grassy Stunt Virus

OR

Tungro Virus



**"RED & SHORT"
(RED LEAVES & STUNTED PLANTS)**

Could be

**Poorly tilled soil
(big chunks of soil prevent root mobility)**

OR

Root knot Nematode



**OLD LEAVES TURN YELLOW
WITH BROWN SPOTS**

Could be

Potassium Deficiency

OR

Tungro Virus

OR

Stem Rot

Farmers Address Pest Problems in a Variety of Ways:



Change the Varieties

In Shwebo, after consecutive years of pest infestation, farmers began to realize that certain varieties, such as Shwebo Paw San, are more prone to infestation. They consequently started to grow other paddy varieties or other crops on some parts of their farms in order to minimise their risk in the event of pest infestation, and would sometimes switch up the crops on the entirety of their farms to “starve” the pests.

“We want to grow Bay Kyar (Paw San) seeds, but we don’t dare to grow [it] because it has a lot of pest problems.” [SHB-IND-GRP01]

Change the Timing

Many pests and rodents have a favourite time to eat the paddy plants—be it when the rice is shooting or after it has matured. Many farmers start to incorporate the seasonality of pest and rodent problems within their farming cycles. In Pyay and Danubyu, none of the farmers want to grow shorter-lifespan paddy or start planting ahead of everyone for fear their fields will be the first to get eaten by the rodents. In Shwebo, brown plant hoppers attack the fields just before the rice shoots come out in the majority of the fields. Hence, many farmers decide to grow varieties with shorter lifespans or decide to transplant earlier in order to avoid the peak infestation season.

“For monsoon paddy, we all have to grow at the same time, but if someone grew it earlier than the rest, that person will suffer from rat infestation once it starts to seed”. [PYI-IND-GRP01]

“Rats now are smarter than they were before. We used to be able to pour water in a hole and they would come out. Now they will have made nests with grass, so they float on the water”.

– Rat Catcher [PYI-IND-M01]



Organise for Group Action

Farmers become more organised in times of emergency. In Shwebo, farmers organised to set village-level fire traps to catch the yellow stem borers. In Pyay, all farmers agreed on growing the same varieties with the same lifespans in order to even out the losses of individual farmers.

“In the old days, you would harvest early to get a better price, but now we all plan to harvest at the same time to reduce the pest damage”.

[DNU-IND-M02]

“We inform each other if the field is pest-infested”. [PYI-IND-F02]

Try Out Different Options & Share Success Stories

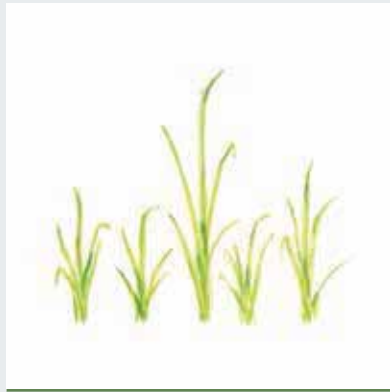
Since the same problems keep coming up each year, farmers have begun to experiment with different methods of tackling the problem. When successful, the farmers share their experiences with each other.

“One person in the village will try a pesticide. If it works, then [he or she] will recommend it to everybody else”. [SHB-IND-COU03]

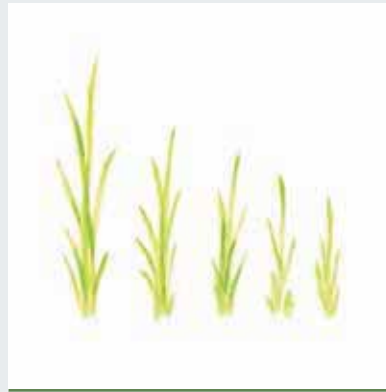
“Usually, farmers ask for a specific branded product because other farmers were successful with it and they all want to use it. Even if there’s a correct product under the same brand, they only want what the other guy used”. [PYI-IND-M09, Input shop salesperson]

Figure 1.08

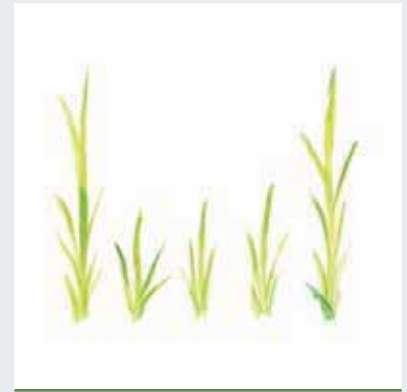
Signs of Crop Problems



MIXED HEIGHT



SLOPING HEIGHT



SHORTER & SPOTTY

CAUSE

A mix of different varieties of rice are growing in a single field.

Land and /or water levels are uneven, causing some plants to receive too much or too little water.

Nutrient deficiency in certain parts of the soil.

EFFECT

Mixed paddy/rice yield a lower price from millers.

A single field will have varied harvest times, likely resulting in lost yield due to premature harvest of certain plants.

A single field will have varied harvest times, likely resulting in lost yield due to premature harvest of certain plants.

Use of Agrochemicals

The overuse of agrochemicals without having a holistic understanding of the problems is still common and detrimental for farmers.

Common sense persists, but it does not always coincide with appropriate practices for effectively treating pests. As mentioned earlier, farmers are quite willing to try new things only after seeing their effectiveness consistently. However, when the loss potential with pests and disease in a single crop is too great, farmers will often try anything and everything to get their crops to be healthy again. This behaviour is particularly dangerous when it comes to pesticide and chemical use, as overuse and misuse is unhealthy for both those applying the chemicals and for the crops, soil, animals, and beneficial pests in the ecosystem.

Using pesticides as a preventative measure:

Surprisingly, many paddy farmers prefer to start spraying pesticides ahead of time, even in the nursery plot or when the plant is only 45 days old, without any evidence of pests, as prevention. When there was an outbreak in yellow stem borers in Shwebo in 2013, the pest was unfamiliar to many farmers who, naturally, were caught off-guard. The symptom-based diagnostic method that farmers used didn't help, either, since the initial state of a stem borer infestation is asymptomatic. By the time the farmers identified the symptoms, it was too late. In the following seasons, farmers responded to this stem borer outbreak by overusing pesticides, which killed beneficial insects, thereby inviting more problematic ones. In the following year, there was an outbreak of brown plant hopper, a grasshopper-like flying insect—a species typically controlled through a natural balance with friendly insects. A



SPORADIC YELLOW TIPS

Pest infestation (as pests often hop from plant to plant).

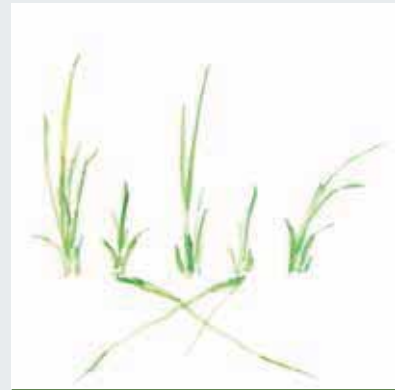
Potential loss in yield for affected plants, if not treated in a timely and effective manner.



GROUPED YELLOW TIPS

Diseased plants (which spread between plants in immediate proximity to each other).

Potential loss in yield for affected plants, if not treated in a timely and effective manner.



SPORADIC FALLEN PLANTS

Rodent infestation.

Potential significant loss in yield (often unpreventable if infestation occurs after seed shooting).

similar outbreak of brown plant hoppers happened in Vietnam in the 1980s from overuse of pesticides. Across Myanmar, brown plant hoppers are becoming more and more prevalent, as the use of pesticides has increased in recent years.

“Until ten years ago, we didn’t have to use pesticides. Every year you get strange new pests. I feel like they come with the pesticides. I’ve never seen a pest that didn’t have a pesticide for it.” [DNU-IND-M14]

Using fertilisers as a preventative measure:

Sometimes, farmers may add more fertilisers than needed in order to give an extra boost to the plants so that they can withstand pest problems. Farmers rationalise that, since they are afraid of losing everything during infestation, they would rather spend more in the inputs, thus hoping to retain some plants.

“If there’s a pest, I use fertiliser. It’s troublesome to use pesticide”. [PYI-IND-GRP01]

Preventative measures are taken out of fear of past experiences with pests repeating themselves. Such over-treatment can lead to other detriments, such as lack of soil fertility and a reduction of market, given a gradually increasing awareness across Myanmar of the danger of chemicals and pesticides.

“We need someone [to use] pesticides wrongly for everyone to use [them] correctly”. [PYI-IND-F09]





OPPORTUNITY AREA

Crop Insurance

With an increased prevalence of pests and disease, and the unpredictability of weather, farmers have become less confident in their ability to assess whether the quality of inputs is having an impact on their yield. The risks associated with even a partial loss in crop can be catastrophic, causing farmers to go deeper into debt, thus forcing them to sell off assets and land.

Although there have been challenges in effectively implementing crop insurance in other markets—due to the acute awareness needed to mitigate risk for the insurer and the presence of a strong value proposition for the farmer—there is potential for a properly structured insurance product to maintain financial stability for farmers in unpredictable times. Crop insurance is most effective in combination with other solutions, for example, access to seeds/markets and actionable weather information.



The background of the entire page is a close-up photograph of a vibrant green leaf. The leaf's veins are clearly visible, and several small, glistening water droplets are scattered across its surface, particularly on the left side. The lighting is soft, highlighting the texture of the leaf.

OPPORTUNITY AREA

Ecology Education for Farmers

There is a significant disconnect between information available as the result of scientific advancements and the current practices of farmers in Myanmar. Though their practices are based on historical experience (and have, for the most part, been effective), there is an opportunity for an appropriate and engaging translation of modern ecological information and solutions for farmers to update and adapt their practices to a changing ecology.

Farmers will soon need to take a much more proactive role in regards to how and when chemicals are used in their farm. A failure to do so will result in the depletion of soil nutrients. They will also be less competitive in markets where scrutiny of pesticide use is higher (due to increased international market demand/regulatory quality controls).



1
Above,
A rat catcher
holding
version 2 of
his hand-made
crossbow

Dealing with emerging rodent outbreaks

In Pyay and Danubyu, rodents have been a major problem for over a decade. When the infestation is severe, a farmer may lose his entire crop, which could lead him into a downward debt spiral.

"I was supposed to get about 260 baskets of paddy from my field in the last harvest. However, I only got about sixty because the rats destroyed my field". [DNU-IND-M07]

Multiple villages we visited in Pyay cited plans to plant similarly timed varieties simultaneously in order to, as one farmer put it, "share the destruction". However, self-preservation prevailed in at least one case (in others, planting was yet to start), with farmers planting in order to protect their individual crops, despite the agreement.

In Danubyu, when the rodenticides failed to kill the rats, one farmer tried to kill them by irrigating the farms higher. When this method was found to be successful, it spread throughout the village.

"They went to the pesticide shop in Danubyu to get rodenticide, but it didn't work well. Then one farmer tried to irrigate the land, which worked better. Then the others followed and did the same". [DNU-IND-GRP03]

Although the rodents are prevalent enough that the farmers are making their farm inputs or timing decisions based on their lifecycle, the government authorities have made little acknowledgement of the outbreak and have similarly taken little action. Most of the problem solving for rodents is initiated by the farmers themselves or by a local rat catcher.



Vignette: Rat-Catching Business

Where others see pests, rat catchers see money. With very little start-up costs and a multitude of free products scurrying around, rat catching is a great added source of income and a public service well appreciated by village neighbours.

2
Above,
Common rat traps,
often placed in the
paddy field

Considered a delicious accompaniment to a cold beer, rats are a cheap added source of protein for villagers. A fistful of tails, about fifteen to twenty rats weighing one viss, can earn 2,500 kyats. During high season when the monsoon floods rats' homes, a good catcher can snag 80 rodents a day. Although paddy farmers do not pay catchers to work their fields, pea farmers are willing to hire their services, as rats prefer pigeon peas over paddy. Pea farmers pay 3,000–4,000 kyats/day regardless of the number caught. The drawback is that during low season one can only get 20 rats a day, so this line of work is more suited to part-timers.

As the rat-catching business becomes more popular (there were up to four new competitors in one village we visited), one particular trend to be aware of for those considering a future in rodent hunting is the rapidly evolving innovations of their prey.

"The rats now are way smarter than they were before. We used to be able to pour water in a hole and they would come out, but now they will have made nests with grass they can float on, so they float on the water".

[PYI-IND-M01, rat catcher]



Figure 1.09

Solutions to Crop Problems

WEEDS

HERBICIDES

Chemicals sprayed to kill weeds, mostly grasses.



3

1 PERSON x 1 HOUR
x 3 TIMES

15,000

30,000

MANUAL WEEDING

Individually picking out, by hand, each weed/ invasive grass



480

10 PEOPLE x 2 DAYS
x 8 HOURS x 3 TIMES

180,000

N/A

WEEDER

A machine pushed between rows of paddy that uproots weeds



72

3 PEOPLE x 1 DAY
x 8 HOURS x 3 TIMES

45,000

45,000

MAN-HOURS

PER ACRE PER SEASON

LABOUR COST

PER ACRE PER SEASON, IN KYATS

INPUT COSTS

PER ACRE PER SEASON, IN KYATS

+ STRENGTHS

- Easy to use
- Saves time and money

- Can specifically weed out the grasses
- Good for the soil

- Good for the soil

- WEAKNESSES

- Requires consistent application rates as over-application may damage the paddy plant
- Multiple herbicides necessary to weed out all grasses
- Have to spray when paddy is young

- High cost due to labour shortage

- High cost due to labour shortage
- Some grasses cannot be weeded out
- Requires evenly planted rows (drum-seeded or transplanted paddy only)

PESTS

PESTICIDES

Chemicals sprayed to kill pests.



4

1 PERSON x 1 HOUR
x 4 TIMES

20,000

40,000

- Easy to use
- Saves time
- Quick results
- Environmentally damaging
- Needs the right pesticide for the right pest
- Can also kill friendly insects

NATURAL METHODS

Solutions based on the specific biology of the problematic pest.



4

1 PERSON x 1 HOUR
x 4 TIMES

20,000

N/A

- Environmentally safe
- Needs to be done early during infestation
- Cannot use if the pests are already widespread
- Requires scientific literacy in pest morphology

NUTRIENT DEFICIENCIES

FERTILISERS

Supplemental nitrogen, phosphorous, potassium, and calcium. Available both independently and as compounds



4

1 PERSON x 1 HOUR
x 4 TIMES

4,000

100,000

- Easy to use
- Saves time
- Quick results
- Expensive
- Unless applied properly, there can be waste
- Can also dry up the soil

NATURAL COMPOST*

Biological mixture of animal dung, old legumes, and hay



8

1 PERSON x 1 HOUR
x 8 TIMES

6,000

40,000

- Better for the soil as it maintains the moisture
- Cheap
- Compost is rare as many farmers move away from farm animals and towards machines
- Time-intensive to make
- Only replaces Urea/Nitrogen fertiliser

ISO9001 : 2000
NO: 0205Q10226R0S

Read the instructions carefully before using the generator. The generator is a portable power source and should be used in a well-ventilated area. It is not to be used in a confined space. The generator is not to be used for medical or life support equipment. The generator is not to be used for power tools or other high power equipment. The generator is not to be used for power tools or other high power equipment.

ORIGINAL ENGINE



Model: JY1500
Power: 1500W
Voltage: 220V

JIANGYAN



OPPORTUNITY AREA

Myanmar-language Assets across the Value Chain

As accessibility to international goods increases, individuals throughout the value chain will strive to keep up. Key to their empowerment is understanding how goods and services work and how to properly administer an input or practice a technique. Not only are these new entrants to the market often missing the mark in terms of their products' appropriateness (as we've discussed in the mismatch between equipment available and the nature of farms and farming in Myanmar), but often labelling, contracts, instructions, and manuals have not been translated into the Myanmar language.

For example, at the close of an interview with a successful mill owner in Shwebo, one of our team members spent time translating a contract he had received for the purchase of a new piece of equipment: a US\$ 200,000 paddy dryer. The contract (which was entirely in English) was not only a barrier to him growing his business, but also an opportunity for him to be taken advantage of by the manufacturer.

Archetype

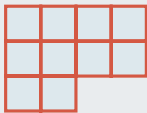
05



INPUT SHOP OWNER

Land Ownership

10 acres

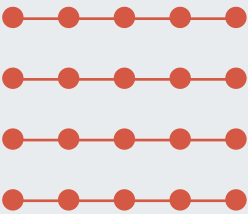


Income Diversification

- Fertiliser shop
- Gold shop and informal money-lending with gold collateral
- Pharmaceutical store

Outlook/ World View

20 years



Biggest Challenge

- Subject to increased defaults when farmers have failed harvest
- Decreased margins due to more competition in agrochemical market

Capital Need/ Loan types

Multi-year business loan with flexible payment scheme

Toe Lwin, 57

Danubyu

Family:

Married with a daughter aged 26 and a son aged 20. Has two grandsons.

Education:

Education: BA degree

“It used to be that you could lend to one hundred farmers and they would all pay you back, [but] now it’s more like twenty-five will...”

Toe Lwin moved to Danubyu township from Nyaung Pin Tha village twenty years ago. His background in farming, and ties to the native village create a close relationship with his customers. He sells many brands of agrochemicals, seeds, and the equipment to administer them. He is also one of the local representatives for the Myanmar-based Awba company. He receives stock on credit from his suppliers. As with most input sellers, he went through a number of training sessions on usage of the agrochemicals offered by the companies.

Toe Lwin believes that good customer service is the key to attracting more customers and retaining existing ones. At the point of purchase, he takes the additional step of making sure his customers understand the safest and most effective ways to use the agrochemicals he sells. In addition, he offers his products on credit to trusted customers—as is the norm in Myanmar with input stores—often taking a percentage of cash down.

Selling on credit is a significantly risky undertaking for him because he is liable to pay his suppliers in full even when his customers fail to pay him. Recently, he has had more challenges with farmers defaulting on their debt, which he attributes to farmers’ vulnerability to shocks, an increase in input shops (poor standing with one does not affect the ability to gain credit with another), and the lack of legal infrastructure to cost-effectively prosecute those who default. This is further complicated by the prevalence of a village-broker model, in which a single person purchases bulk inputs for a village on credit in order to resell. In the past, he has had to chase 100 lakh from Danubyu to Myitkyina after a broker skipped town without paying.

In addition to the input shop, which family owns a nearby gold shop that his daughter manages. There is a considerable overlap between their customer base because many farmers borrow money from the shop with gold as collateral in pre-harvest and buy gold as savings in post-harvest. In the case of a failed harvest, they either sell off their gold or pawn more for additional credit. Therefore, the gold shop remains profitable in both good and bad times. It also helps him make better decisions regarding the credit worthiness of customers of his input shops.

When he first began his agrochemical business eight years ago, the growth was exponential. Now, despite the constant business and increase in input use by farmers, margins have been driven down due to increased competition. Depending on developments in the farming industry and input market, he is prepared to shift out or lean into it. Being a shrewd businessman, he has recently branched out to open a pharmaceutical store in town, thinking ahead to expand his businesses so that he can leave them as inheritances for his two grandsons, aged two and five.



Above,
Day labourers harvest
monsoon paddy in Pyay

Training & chemical handling

Shop owners and employees are taught proper application methods by the suppliers of products their stores carry. While some shops carry protective gear for purchase, others do not, instead relying on farmers and those who administer chemicals to procure their own.

All the shops we encountered advise on application methods and read the instruction labels to farmers to help them in proper application.

We heard stories in the field about families with input shops who got sick, with some members passing away—due, it is hypothesised, to living in the same rooms as their chemical stocks. In many cases, chemicals were kept behind glass to obscure the unpleasant smell from customers. However, employees were often still exposed to fumes throughout the day.

Relationships with Farmers

As many input shop owners and employees have little or no agricultural background, it's often difficult for language and techniques to be effectively passed on. In a shop in Shwebo, a salesperson told us that, before she joined (having come from a farming family), the shop owners and other salespeople had a difficult time discerning information from farmers, such as their land size, which farmers would describe in terms of yield or people required to work rather than in acreage.

In many cases, farmers come to shops with a brand or product they want, based on a neighbour having had good luck with it. In these cases, it is more difficult for the shop employee to consult and advise on the best treatment for the farmer.



“People do come in and request a specific brand. It may not be suited for their crop or condition, but it may be because they’re representing another person and they want a specific product”. [PYI-IND-M09, input shop salesperson]

Labour & Machinery

Rice farming is extremely labour-intensive, absorbing a substantial percentage of the rural workforce in Myanmar. Nearly three fourths of farm household income is derived from rice farming and related activities, especially in the main rice areas of the Ayeyarwady, Bago, and Sagaing regions (Wong et al 2013). However, many rural labourers are unable to survive on farm-related wages alone. As farming is a seasonal business by nature, labourers face extreme hardship during off-seasons, with many migrating

to urban areas in search of more stable streams of income at construction sites and manufacturing facilities. Meanwhile, farmers are adapting to these new labour realities and finding solutions to deal with labour shortage problems.

Though rural wages have increased significantly in response to the dwindling number of farm workers, those who rely on manual labour for income (typically those with limited or no farmland) are still struggling to make ends meet due to increases in their cost of living.





1
Previous, Left
Day labourer holds
a sickle while
harvesting paddy

2
Previous, Right
Day labourer removes
her boots at lunchtime
to dry off

3
Right,
Team of day labourers
at harvest





Archetype

06



RISK-AVERSE DAY LABOURER

Land Ownership

None



Income Diversification

- Day labour (paddy farming, black gram farming)
- Fishing
- Pig breeding (sell piglets)
- Net weaving
- Catching aquatic insects
- Remittances from children

Outlook/ World View

1-3 years



Biggest Challenge

- Maintaining multiple income sources
- Keeping pigs healthy

Ko Soe Tint & Ma Khin Win Kyi

Family:

Husband and wife
with a son and a daughter

Education:

4th grade

“We would work in a factory if it were in Danubyu. We do not want to leave our home; we were born in this village.”

Ko Soe Tint and Ma Khin Win Kyi live in a village near Danubyu. Their village has seen many families' members migrate to nearby Yangon and surrounding areas, where they can find consistent work in factories and on construction sites. Even though they are without farmland, the husband and wife have maintained their social status in their village through by multiple income sources.

In addition to working as day labourers on villagers' farms, they breed pigs, fish in a nearby stream, and catch other aquatic delicacies for sale like cicadas and eels to sell—and also sometimes weave fishing nets for others in the village. Because of their proximity to Danubyu, they don't have to carry their fish to markets to sell; brokers come to them. They earn on average three thousand kyats a day through these activities, and with money remitted every month from their children in Yangon, they are able to live comfortably.

Their two children, a daughter aged twenty-one and son aged nineteen, work at electronics and plastics factories in Yangon, where they make a combined 180,000 kyats every month. Their children joined their uncle, who migrated his whole family to an area outside of Yangon after finding consistent work at a factory.

Unlike their siblings and children, the couple wants to stay in the village, where they hope to continue increasing their quality of life. They borrow regularly from farmers whose land they work, taking loans they then pay off through labour. However, their recent good fortune and a healthy litter of pigs have allowed them to move from borrowing three times a year to only twice, providing a modest but consistent increase in capital to their savings. Any surplus income is invested in gold, which they pawn whenever there is not much work or in case of family emergency.

Despite having diverse income sources, they still find themselves in debt due to the high cost of maintaining their pigs (feed is expensive) and fees of 30,000 kyats per month to sublet the right to fish in the nearby stream. This aside, they hope to be able to purchase some farmland in the next two to three years.

Capital Need/ Loan types

8- to 10-month loans
for pig breeding and
fishing fees

Personal Network

Well connected with
access to Yangon
as well as the local
market

Mobile Ownership

No mobile

Daily Income

3,000 kyats/day
on average (across
businesses)

Type of Migration

Plan to continue
living in the village,
no desire to migrate.

Archetype

07



ORGANISED DAY LABOURER

Land Ownership

None



Income Diversification

Day labour
(paddy farming,
miscellaneous
farming work such
as field clean-up and
land preparation for
the next crop)

Outlook/ World View

1 month

Biggest Challenge

- Keeping up with the rising cost of living despite an increase in daily wage
- Access to work and information about opportunities outside the village
- Inability to afford better tools such as sharper sickles and non-leaking boots to diminish physical hardship of daily labour

Ma Thuzar

“[My kids] are staying with me, no matter what.”

Family:

Married with a son and a daughter

Education:

No School

Now age 40, Ma Thuzar has been working with her family on farms her entire life. As labour has become scarce in the Dry Zone, she has begun to act as an organiser, representing a group of 13 female relatives to work on jobs: two paddy seasons and one for beans/pulses. She sometimes recruits women to work based on farmers' demand.

Her group is caught between a significant shortage of labour and the resulting response of farmers by an increasing mechanisation. Wages are higher than in the past (a day's work averages 3,000–5,000 kyats per person), and the increased cost of living has applied pressure on her and her family. Although machines are steadily replacing day labourers, there is one job that cannot be replaced: transplanting paddy, which is her main job.

She requires two days' advance notice in order to organise a group for a new job, as her family members also take other jobs ploughing weeds, fishing, catching frogs, and weaving. Each season, she collects 2,000 kyats per person for organising the group. She says, “I am committed to this job because I am a labourer myself and I know how it feels to not have work. I want to help everyone have a chance”. [SHB-IND-F01]

Though some people from her village have left to find work with relatives in larger towns and cities, she and her family have no network in these places, so they feel trapped in their village and the work available to them there. Her husband, daughter, and son also work as day labourers. As tough as the work may be, she says she doesn't want her children to travel elsewhere to find work: “They are staying with me no matter what”. [SHB-IND-F01]

Capital Need / Loan types

Financing solutions for basic transport to increase access to markets and more job opportunities

Personal Network

Very limited personal network. Job options are confined to the local village.

Mobile Ownership

Proximate access to mobile

Daily Income

3,000 kyats/day when working. Otherwise lives on advances/credit.

Type of Migration

Has desire to migrate to urban areas, but no personal connection to do so



A note on Day Labourer Archetypes

Conditions are tremendously varied for labourers across Myanmar, as can be discerned from the differences of our two archetypes. It is clear in contrasting the two how information flow and the

range of one's network can drastically affect income and outlook.

Factors such as proximity to a large city (namely Yangon or Mandalay) or to other large hubs affects

both the awareness and reality of labour options for workers. Geographic diversity (and ability to take advantage of natural resources such as fish and insects), affordability of transportation, and the

prevalence of affordable farm equipment all play a role in both the types of work available and the market rate for daily labour.

	Archetype 06 Risk-Averse Day Labourer	Archetype 07 Organized Day Labourer
Land Ownership	None	None
Income Diversification	<ul style="list-style-type: none"> - Day labour (paddy farming, black gram farming) - Fishing - Pig breeding (sell piglets) - Net weaving - Catch aquatic insects - Remittances from children 	Day labour (paddy farming, miscellaneous farming work such as field clean-up and land preparation for the next crop)
Outlook/ World View	1-3 years	1 month
Biggest Challenge	<ul style="list-style-type: none"> - Maintaining multiple income sources - Keeping pigs healthy <p>8- to 10-month loans for pig breeding and fishing fees</p>	<ul style="list-style-type: none"> - Keeping up with the rising cost of living despite an increase in daily wage - Access to work and information about opportunities outside the village - Inability to afford better tools such as sharper sickles and non-leaking boots to diminish physical hardship of daily labour
Capital Need / Loan types	8- to 10-month loans for pig breeding and fishing fees	Financing solutions for basic transport to increase access to markets and more job opportunities
Personal Network	Well-connected with an access to Yangon as well as the local market	Very limited personal network. Job options are confined to the local village.
Mobile Ownership	No mobile	Proximate access to mobile
Daily Income	3,000 kyats/day on average (across businesses)	3,000 kyats/day when working. Otherwise lives on advances/ credit.
Type of Migration	Plan to continue living in the village. No desire to migrate.	Has desire to migrate to urban areas, but no personal connection to do so





OPPORTUNITY AREA

An Increase in Skilled and Specialised Labour

The push and pull of labour scarcity and mechanisation puts the labourer in a challenging position, and sharply in contrast to a skilled service provider or artisan such as a blacksmith. Increased education and access to training are the keys to growing the rural economy across the board. However, they most benefit the landless and those who rely on their skills to generate income. As labour becomes scarcer and is mirrored by a reduction in the need for labour, that which is required will be specialised, skilled, and higher-paying.

In Pyay, we met a day labourer unlike most. Much of her group's ability to win work with village farmers is due to training she received from Japanese researchers on more scientific methods of transplanting and other farming techniques. She then trained her labour group on these techniques and at times advises the farmers about pest problems and plant issues they see in the fields. She is considered a skilled worker, and her group is able to retain farmers they work for year after year.

What Does It Mean for Farmers to Adapt to New Labour Realities?

Every farmer we met is acutely aware of the implications of labour shortages in their farming operations. As the labour landscape continues to shift, farmers are finding themselves in new and challenging situations.

Less Bargaining Power

Many farmers acknowledge they have less bargaining power over labourers than they did in the past. While they used to have an unrivalled influence over landless or land-poor households, the tables have turned, and farmers make extra efforts to maintain a good relationship with labour groups by providing basic necessities to labourer families during off-seasons, such as and paying more competitive wages.

"Definitely there's a labour shortage, so you need to treat workers well. That means even if I don't have enough work, I have to provide them with basics, give food". [SHB-IND-COU02]

"We are at the labour group leader's mercy during the transplant time". [SHB-IND-F03]

Increased Mechanisation

As a savvy farmer in Shwebo [SHB-IND-M06] aptly put it, "this era is a machinery era". Many farmers have increased the use of machinery in their lives even outside of farming practices, including in transportation, either by buying on their own or renting from someone else. The fields in Myanmar were traditionally ploughed with cattle or water buffalo. However, two-wheeled tractors imported from China have gained popularity among farmers over the past decade, reducing the land preparation time and enabling a short turnaround between crops. Regardless of their reputation for poor quality and high maintenance costs, those tractors continue to be the most affordable solution to farmers' labour problems.

"I am one of the few people who still have cows. Many people have gotten rid of them." [SHB-IND-F03]

"I spend about 200,000 kyat per year on maintenance. My tractor maintenance cost is high because I use it a lot. I use it for ploughing, for transport of paddy, for transport for sand in construction. I also rent this tractor out, too" [SHB-IND-F03]

“Definitely there’s a labour shortage, so you need to treat workers well. That means even if I don’t have enough work, I have to provide them with basics, give food.”

– Farmer, Shwebo [SHB-IND-COU02]

Fewer Labour-intensive Farming Techniques

We witnessed several farmers choosing to broadcast seeds (which they can do themselves, without hiring labour) rather than more labour-intensive transplanting—although they are aware that the latter will yield more optimal results.

“We started broadcasting directly into the field instead of doing a nursery, because of the labour shortage. We should be transplanting instead—but we can’t”. [PYI-IND-COU02]

More Chemical Usage

Farmers rely more and more on chemicals to manage weeds in their fields, abandoning the age-old method of manual weeding.

“I only use weedicides because I’m afraid to weed manually. The labour cost is not worth it”. [PYI-IND-M05]

Partnership with Other Farmers

Some farmers have formed partnerships with other farmers to share labour and machinery. For example, a farmer we met in Shwebo plans his planting and harvesting activities together with his farmer friend so they can share resources during those time-sensitive periods. A young farmer in Danubyu partners with his two neighbours to rotate working on each other’s farms so that no longer need to hire additional labour.

“I harvest and plant at the same time as my friend. He’s a larger farmer, so we can share equipment. We also harvest at the same time”. [SHB-IND-M10]

OPPORTUNITY AREA

Equipment Rental and Financing




The cost of modern farm equipment puts it out of reach of smallholder paddy farmers, unless they have access to equitably structured finance. While equipment companies do currently offer financing (in partnerships with banks), the terms are still challenging for smallholders.

Equipment rental schemes are becoming more common, especially for high-cost machinery that is needed for short, discrete tasks (such as harvesters and threshers). However, challenges with these rental schemes range from saturated reservation periods (due to high demand around harvest and planting time) to inconsistent infrastructure to support their use (for example, wide enough roads for a harvester to access a farmer's land). There is an opportunity for comprehensive rental solutions (machines + labour, or machines + other services) to more effectively meet the needs of farmers in a cost-effective manner.



Figure 1.10

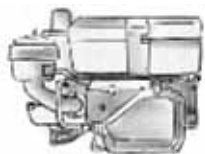
Farming Machinery

	TILLING		SEEDING
	MECHANICAL HAND TILLER	POWER TILLER	DRUM SEEDER
			
PURPOSE	After harvest, farmers use the mechanical hand tiller to turn the soil over, causing the cut paddy stalks to decompose into fertilizer. It's a process the farmers call "reversing the soil", as in, returning it to its original state.	Serves the same purpose as a mechanical hand tiller, but with more power. Some power tillers have blades that can be changed and used for harvesting.	A systematic alternative to broadcasting seeds. The drum-seeder provides more control and consistency in the distribution of rice seeds.
COST IN LAKHS	4–10	50–100	0.8–1.2
OPERATIONAL COST ANNUALLY, IN LAKHS	0.2–1	0.9	0.2
PEOPLE TO OPERATE	1	1	1
TRADE OFFS / REQUIREMENTS	<ul style="list-style-type: none"> • Requires manpower • Breaks down easily • Shorter lifespan 	<ul style="list-style-type: none"> • Requires access to farm via road • Expensive 	<ul style="list-style-type: none"> • Requires level land and land prep • Takes twice the time of broadcasting
APPROXIMATE LIFESPAN	10 YEARS	15–20 YEARS	2 YEARS*

*Plastic parts may break earlier; adequate data is not available as acceptance is not yet widespread

IRRIGATING

DIESEL-POWERED PUMP



Provides power for irrigation pumps for consistent, powerful water irrigation of 2–5 acres.

0.9 – 6

0.9–2.4

1

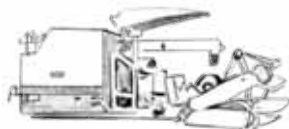
2-6 PEOPLE NEEDED
TO MOVE IT

- Provides adequate power, but requires daily fuel costs
- Noisy
- Heavy and difficult to move

3 YEARS

HARVESTING & THRESHING

COMBINE HARVESTER



Driven directly onto the farm. Operates as a harvester and thresher, combined into one machine.

120 – 300

~50,000 KYATS/ACRE
TO RENT

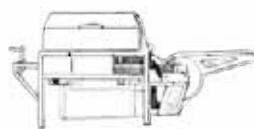
2

1–3

- Requires access to farm via road
- Plows over weaker stalks
- Expensive

>10 YEARS

PADDY THRESHER



Separates paddy seed from plant stalk. 250 kg/hr–1,000 kg/hr

40 – 100

~20,000 KYATS/ACRE
TO RENT

0.1 – 0.2

3–5

- Paddy stalks must be hauled to it
- Slower than a combine
- Can get clogged when paddy is wet
- Requires manpower

>10 YEARS







Other Factors Driving Mechanisation

Labour shortage isn't the only factor contributing to mechanisation. Changing environmental conditions and tougher-stalked paddy varieties necessitate machine use. The increase in soil "slipperiness" in Pyay has made it difficult to plough by cow and quite challenging for humans. The toughness of certain rice varieties makes them more difficult to harvest by hand, and labour groups (who have a rare point of leverage based merely on the short window for harvest) dislike working farms on which it's grown.

"Slippery soil makes it so the cows cannot work it, and also is difficult for the trucks."

[PYI-IND-M02]





“One problem is that farmers want to test the bigger equipment before buying them and after assembly, but right now, all the equipment shops are in the city.”

– Farm Equipment Salesperson, Pyay [PYI-IND-F03]

Vignette:

Farm Equipment Seller

As mechanisation increases, so does the role of equipment companies. We found two primary sales channels for equipment companies. Most tended to open demonstration shops in townships, to which farmers must travel in order to purchase and harvesters, or buy parts for existing machines. However, Good Brothers, a local company, uses direct sales into the villages in order to reach farmers.

Shwe Nanda and his father both have backgrounds in mechanical engineering. After he put together his first tractor, people in the village started coming to him to get things fixed, and he found himself in business. He had a lot of work and would even contact equipment companies on behalf of his customers. During that time, he sold two tractors, and decided to become a salesman.

In the beginning, Good Brothers did not have a Shwebo shop, which made it cumbersome to send parts and conduct business. Most other dealers are located in the township, and farmers come out to the store in order to make a purchase. Shwe Nanda, however, moved from Mandalay out to Shwebo when the company created a new office there. He is a part of the Shwebo community and spends much of his time connecting and being a useful hub of information and resources to his neighbours.

Trust and reputation are very important to Shwe Nanda, and he spends much of his effort cultivating long-term relationships and goodwill with his customer base. Good Brothers uses a direct sales method, so Shwe Nanda

1
Previous Page,
An equipment shop
owner

is heavily involved with orchestrating the entire purchase experience, which is particularly key when entering a new village.

2
Right,
Rows of hand tillers

“Usually, when someone does something new in a village, the villagers use doubtful eyes. They want to see if the new equipment works, how long it lasts, will it break. They will look at the first guy’s purchase. They don’t have capital of their own yet. So they try to get the best out of other people trying out stuff”.

[SHB-IND-M14]

His sales strategy is to grow along with the farmer. When a farmer hits ten acres, it becomes more cost efficient for him to purchase a tractor. After that, Shwe Nanda notes a list of tractor attachments that farmers will likely add as their income grows. “The farmers know in general what is good, but they trust the sales guys.” [SHB-IND-M14]

He provides credit through banks, for which the farmers apply on contract day. His commission differs based on whether the farmers put down cash or credit. Although he used to be involved with providing after market services to fix parts, now he simply refers people to his network of mechanic friends. In the eight years he has worked in Shwebo, he’s proud to have become the number three salesman in the region, out of a team of 25. He notes that he’s achieved this despite also working on many other businesses. His latest project is getting into mobile money, for which he displays a bright yellow advertisement showcasing his new products.









Not-quite-right equipment

There are many cases of equipment misfit as markets develop and manufacturers work to develop regionally appropriate models and machinery. In Myanmar, the need for retrofitting and customisation of equipment has presented an opportunity for value-added services, both for retailers themselves and for independent blacksmiths.

Vignette: **Blacksmith: One Man's Misery is Another Man's Opportunity**

One would imagine mechanisation creating an expanded economy for mechanics and craftsmen who work on maintaining farmers' machinery and equipment. However, the nature of the plots and farming practices in Myanmar and the equipment being imported from other nations don't always match up, and in the delta between the equipment available and the realities of the farm, there are real needs for custom and bespoke mechanical solutions. While in Shwebo, we met with an entrepreneur—a self-taught blacksmith—who has established a successful business in small-run and custom equipment production and modifications.

This young blacksmith is raising two daughters alongside his wife. He quit school in eighth grade to dedicate his life to iron work and travelled all around Myanmar with his mentor, learning to become a mechanic and blacksmith in Mandalay, Monywa, and other areas of the Dry Zone, repairing machines and engines, receiving 40,000 kyats at most for each repair. Through travelling around the country and repairing multiple machines at a time, he began to notice flaws and gaps in the machinery farmers were using. He saw that tractors were breaking down quickly, getting caught in weeds or plants. He saw harvesters and threshers, ill-equipped for the types of paddy being grown and how the farmers were using them, causing the farmers to lose yield with each basket being harvested or threshed.

His attention to detail motivated him to start a blacksmith business in 2010 to fill in the gaps in the machinery market he saw while learning the trade. It took him four years to collect all the tools and equipment he needed to start a workshop for building farming machinery. One of his first inventions was motivated by problems he saw with tractors that caused them to get jammed with weeds and plants during tilling. He decided to build better blades for the tractor wheels by developing a smaller and more compact tooth/blade to replace those that came with the tractors.

1
Previous Page,
A blacksmith shows
us one of his patterns

2
Right,
Custom metal
lettering for a local
shop, the Burmese
character “La”

Soon after, he designed a thresher that resulted in less stray paddy, and was more affordable and functional, with other features to improve yield. “Other threshers take about an hour and 20 minutes per acre. Mine takes 40 minutes. This saves time and labour costs”, he informed us. He designed and prototyped this thresher, making patterns for each piece. Building each new thresher takes about seven days, although he says he can finish one in four or five when there is a rush. As farmers typically wait until the end of the season to order, it’s not uncommon for him to have to work long hours to provide farmers with the equipment they need to complete their harvest in a timely manner. His ability to notice the farmers’ needs, along with his empathy for farmers going through hardships, allowed him to think outside the box to invent solutions. He often sells his machines on credit to farmers, allowing them to pay in full after they have sold their harvest.

When asked about his role in the changing mechanisation market (presumably with increasingly more appropriate and affordable options), and whether farmers in Shwebo might shift away from paddy (to more lucrative sesame or pigeon peas), he confidently describes his interest in and ability to move into other areas for innovation, stating there will always be a need for better products, and that there are many more areas in farming that can use improvement. “There’s always something I can do if there’s no more work in farming. I can build other things or even go into welding”.

His shop currently employs six men full-time (more during rush seasons, such as just before harvest). His shop also produces signage and gates and still does equipment repairs and custom orders. He hopes to diversify in the future, trading rice and taking advantage of the market increases, given the constant demand from millers and the tendency of farmers to sell their paddy all at once.







OPPORTUNITY AREA

Reacting to Rapid Mechanisation

An increase in demand for farm machinery and equipment has opened up the market to more players, however there are still significant gaps in machine/farm fit, proper financing/leasing models and infrastructure required for effective machine use. In each of these gaps lies an opportunity to leverage the existing ecosystem in new ways (for example, through effectively engaging local service providers like blacksmiths). Due to the significant investment required for equipment, it is necessary to provide some kind of scaffolding for farmers to effectively and meaningfully invest in a mechanised future, as well as services to support a mechanised ecosystem.

Harvesting

Harvesting is typically done manually, as farmers either cannot afford to rent mechanical harvesters or do not have the proper roads and infrastructure to allow the machinery to reach their land. In many areas, farmers have to arrange to hire the one and only labourer group ahead of the time for harvest due to the labour shortage. Many neighbouring farmers share a mechanical thresher once their crops are harvested. If you drive down any township road during harvest time, you will find a number of threshers systematically consuming bundles of paddy stalks from the area and shooting out separately organic debris and bags of golden paddy. Because of the lack of labour, farmers are harvesting and threshing on different days within the harvest month, a by-product of which is a reduction in scheduling conflicts around thresher rental and use.





“If there is a storm and it rains hard, the paddy plants fall down. The harvesters or combine harvesters cannot be used then. You have to harvest manually.”

– Farmer, Pyay [PYI-IND-F03]

Harvesting Woes and Maintaining Grain Quality

Rice is traditionally harvested manually using family or hired labour and threshed through trampling by cattle. With the increase in mechanisation, threshing machines have become ubiquitous amongst farmers across the country, although the use of combine harvesters is still limited to areas closer to the main roads or farms with better infrastructure. As simple as it may sound, harvesting is indeed a complex task that requires farmers to juggle the following issues simultaneously:

Time Pressure

During harvest time, farmers are under tremendous pressure for a quick turnaround time to prepare for the second rice or pulse crop (such as black gram), because early crop establishment is associated with higher yield.

Pulses attract a much higher price than rice, but they require specific timing in regards to planting. (Denning et al 2013)

Labour Shortage

As farmers are desperate to get harvesting done as quickly as possible, lack of adequate labour slows down the process. After harvesting, labourers need to focus on land preparation for the next crop. As there is not enough time to thresh the crops manually, the stalks are often stacked un-threshed on the paddy field bunds, a practice that causes losses through rat damage and deterioration of grain quality.

Weather Worries

If one asked any farmer what he is most afraid of during harvest, he would definitely say “rain”. For a farmer, rain is his best friend as well as his worst enemy, depending on when it occurs. If grains get rained on once



Above,
Farmers who do not
use a combine
harvester still rely on
threshing machines
to separate the paddy
grain from the stalk

a plant is matured or the grains have been harvested, the farmer needs to dry them out immediately in order to prevent the deterioration of grain quality. Unfortunately, as most farmers do not have access to drying machines, they must lay out tarps in their yards or on the roadsides to dry their wet grain.

"If I don't dry the seeds out, the inside will turn yellow. But I shouldn't over dry either. Otherwise it is easy for them to get smashed."
[SHB-IND-F03]

Lack of Proper Storage

Though rare, we did encounter farmers who were able—financially and physically—to hold onto and store their paddy to sell at a higher market price. This was most consistent in Shwebo, where high demand (and correlating market price) for Shwebo Paw San has allowed farmers to climb out of debt. However, proper storage facilities rarely exist for small farmers.

Grain Drying

The drying of grains after harvest is a challenge for farmers yet is critical to getting a good price for their product. If grains are moist, they may germinate right away. Many farmers do not have access to dryers and hence resort to sun-drying, which is problematic when the monsoon rains do not end as expected. In the summer, when the heat is too high, the grains may over-dry, leading to brittle and broken milled grains and reducing the quality of (and price commanded for) the harvest.





OPPORTUNITY AREA

Crop Drying & Moisture Control

Maintaining harvest quality for both paddy and other crops, like sesame, are a challenge given the exposure to moisture and improper access to storage. Mills are starting to invest in dryers to maintain and improve the quality of their product prior to processing. However, at the point paddy reaches the mill, it's often too late. Just a couple of days of wet paddy can reduce the value of a farmer's crop significantly and render the quality of the paddy unfit for human consumption due to fungus or mould growth. At this point, it is only appropriate for animal feed. Proper moisture management pre-harvest (through monitoring rain and weather and properly timing harvest activities) and access to dry, clean storage post-harvest can assist farmers in maintaining high paddy quality, resulting in maximal prices paid by mills.







OPPORTUNITY AREA

Connection to markets

It is critical that farmers understand the market for whom they are producing.

We witnessed an awareness of market demands (both variety and the price it commands) change farmer behaviour in places like Danubyu, enabling more foresight and informed decision making on a crop-to-crop basis. Guaranteed market prices, provided by contract farming organisations, also drive similar behaviour. With increased connectivity, the possibility for connecting farmers to both market information and guaranteed sales can potentially catalyse positive behavior change.

OPPORTUNITY AREA

Storage as a way of getting better price

Many farmers sell their crop immediately after harvest—when the market price is at its lowest—to pay off debt. They are also unable to retain their crop due to a lack of infrastructure in which to store and later mobilise it for sale. Access to secure storage (also free of environmental hazards such as exposure to rain/moisture) can potentially incentivise farmers to store some, if not all, of their paddy for future sale.

Coupled with the knowledge to take advantage of a high market, storage infrastructure can provide higher margins for farmer's crops with little to no additional cost incurred.



OPPORTUNITY AREA

Maximising the Short Window between Crops

Optimising for all of the variables that contribute to a successful crop (balancing variety lifespan, weather predictions, and timing of pest infestations) often leaves farmers unable to turn around their land in time to plant the following season's crop. Limited labour and a sparse supply of equipment to go around at harvest pose a challenge, and can result in farmers planting late or missing the opportunity to farm a full season at all. Better infrastructure for equipment-sharing, and better solutions for both harvesting and threshing may be viable. Additionally, a better means of optimising and coordinating for these in-demand periods at a regional level could alleviate additional costs and relieve farmer losses.





Above,
Young paddy plants
waiting for transplant

Access to Capital

Access to appropriate capital is the farmer's biggest need. Six years ago, a Harvard paper on the Myanmar agricultural economy reported that "[farm] credit is scarce or nonexistent with the exception of small amounts (8,000 kyat per acre) available from the Myanmar Agriculture Development Bank (MADB)". (Dapice et al 2009) The rural credit situation has considerably improved since then: MADB offers 100,000 kyat per acre to paddy farmers; a large number of institutions provide microfinance in rural areas; and some Rice Specialized Companies venture into agricultural input loans provision (though their coverage is quite sparse). This is not to say that the formal rural financing sector in Myanmar is developed. In fact, it is mostly under-developed, and still at a nascent stage.

Despite the many formal and informal ways for farmers to access finance for farming, there is still a lack of accessible and properly structured credit for farming activities. (Proximity Designs 2014) Currently, most financing is short-term or seasonal, and principals are still below what farmers

need to effectively grow their crops. Many farmers partake in a veritable smorgasbord of loans in order to obtain the inputs needed for their agricultural activities, which are not necessarily exclusive to farming. This combination of principals and terms—often with their biggest asset, their land, as collateral—forces the farmers to delicately balance their risks, and often results in a cycle of debt, and dependence on each loan to pay off the prior.

Paddy as Currency

Throughout the history of mankind, many things have been used as mediums of exchange in markets, including beads, precious metal, livestock, and grains. Although this practice may be obsolete in many parts of the world, Myanmar farmers continue to use paddy as a currency. Typically, landowners receive paddy as payment for leasing out their land to farmers. The lessor and lessee have to agree on the amount of paddy per acre (i.e., the land rental fee). Interestingly, the former cannot influence the latter regarding which type of variety to grow, although it can impact his income potential quite a bit.



"There's no such thing as getting paid in money for renting out land, only getting paddy. But it's the same thing—you just sell the paddy".
[DNU-IND-M04]

Another common form of informal loan for farmers is called "sabar pay", which literally means "giving back in paddy". A farmer may borrow money or inputs such as fertilisers in the beginning of the farming season and pay back the lender in paddy immediately after harvesting, regardless of the yield from his fields. The arrangement is similar to a "futures contract" in such a way that the lender (buyer) and borrower (seller) decide on the quality and quantity of paddy to be delivered to the lender at a predetermined price. There is no standardised set of terms for such transactions; each deal is negotiated entirely between the buyer and the seller.

Insolvency and Defaults

Over-indebtedness remains high among paddy farmers, although the availability of rural credit has increased to some extent. The resounding theme we heard from input shop owners in all three locations we visited was that farmers have become less trustworthy in recent years, while some blame the lack of financial literacy among farmers. Many claimed that high default rates put their businesses in jeopardy.

"The thing that we need most is financial literacy now for the farmers. The farmers have to manage their income, revenues, basic earnings".
[Ye Min Aung, MAPCO]

"The farmers are no longer honest. The farmers don't repay their money. Hence, there are many lawsuits". [PYI-IND-F04]

"I used to sell fertilisers, but farmers didn't want to pay back the money for products they bought on credit. It makes it hard to do business if they don't pay back, and it's emotionally draining asking for money back all the time".
[DNU-IND-M09]



If we dig deeper into the issues, the fundamental problems are rooted beyond a question of farmers' character or their level of financial literacy. When a farmer's current debt burden is larger than his expected income, it is almost impossible for him to escape from the perpetual cycle of debt. Many farmers we observed admitted they use funds borrowed at lower interest rates from sources like MADB or microfinance institutions to pay other high-cost debt. MADB loans are notorious for not being dispersed until late every season, forcing farmers to get high-cost informal loans to bridge the gap. In Shwebo, we met a large-mill owner who also grows paddy as a hobby and is involved in rice trading. He claimed that "growing is the least profitable for him because of uncertainties involved and a long waiting period until the harvesting time, whereas trading is the most lucrative".

"If I get credit from an outside lender, the interest rate is fifteen to sixteen percent per month."
[PYI-IND-F03]



OPPORTUNITY AREA

Specialised Financial Services

With a limited suite of financial services, investing and saving in formal financial systems is, for most, out of the question. However, even more disparate is the gap between diversification and the availability of credit products on the market.

Farmers with access only to credit products structured specifically for crop-based activities (and even those are out of sync when it comes to principal and terms) find themselves utilizing multiple loans (often with escalating interest rates). Farmers and other small agribusiness owners require more flexible and appropriate services to support their businesses.





OPPORTUNITY AREA

Inability to Capitalize on the Market

When farmers are in debt, they are typically unable to capitalize on the market.

“The extreme shortage of credit leads to a glut of paddy for sale at harvest time, as farmers have to scramble to repay debts. This creates very low farm-gate prices at harvest time. Again, almost all farmers we talked to had little if any paddy left over for home consumption right after harvest because they had to sell everything at harvest time”. (Dapice et al 2011)

OPPORTUNITY AREA

Inability to Make Optimal Choices

In an attempt to avoid acquiring more debt, many farmers try to save on fertilisers, either by using poor quality brands or less optimal amounts, which will decrease the crop yields and their income. Similarly, some have to settle on poorer quality farm machinery despite there being better options.





OPPORTUNITY AREA

Debt Forgiveness

Systematic, village-wide elimination of debt has the potential to provide a financial foundation for income stability to rural families. As simple debt forgiveness does not ensure against future debt acquisition and cycles, programs and services need to support sustainable credit practices and financial services if farmers are to maintain their quality of life and livelihood. Conditions for forgiveness will also need to be carefully outlined in order to protect the long-term behavioural impacts of the action.

“I’m not growing monsoon paddy—I’m giving the soil a rest. I will resume next summer. I learned to do this after I skipped a season once, and found that yield for the same variety was better afterwards.”

– Farmer, Pyay [PYI-IND-M01]

Adoption & Where farmers learn techniques

Almost all the farmers we met learned how to farm from their parents, and similarly are now teaching the next generation of farmers. Although this kind of learning is sustainable, it does not readily allow for the incorporation of new farming techniques. Many farmers we met believe they are experts in the most up-to-date farming techniques. They also believe that farming techniques have not changed dramatically over the last few decades, although their specific activities in each step of the crop cycle have changed.

“I taught my daughters how to farm and that’s more than enough for them. They don’t have anything new to learn”. [SHB-IND-M04]

“I’m not growing monsoon paddy—I’m giving the soil a rest. I will resume next summer. I learned to do this after I skipped a season once, and found that yield for the same variety was better afterwards”. [PYI-IND-M01]

When it comes to new farming techniques, technologies, and auxiliary businesses, it is common for farmers to express a similar skepticism around trying anything new and unproven on their crop. Farmers become aware of new techniques and practices relatively quickly, but they pay them little mind until they have been proven as both beneficial and low-risk.

In general, new technologies and methods are adopted after farmers see a successful outcome for two consecutive seasons in the farms of their neighbours and peers. The exceptions are farmers with enough land to experiment across their acreage in order to mitigate risk. A new technique is often introduced to a village via an expert, who typically works with a local farmer who is willing to try out a certain technique while the neighbouring farmers wait to see the results. Not until the technique has been proven successful for a few consecutive seasons is the whole community willing to adopt it.

“I waited to see how other farmers did with Htun Pu, the new variety. This year, I am testing it out with about thirty baskets of seeds”. [DNU-IND-M07]

However, many neighbouring farmers are only copying the activities of the more experimental farmer, without fully understanding the reasons or logic behind them. Hence, farmers sometimes end up using the wrong technique or making customisations that reduce the overall technique’s benefit. A farmer we met in Shwebo was too proud to ask why his neighbors were doing what they were doing, and assumed that he understood everything about the technique. Our conversation, coupled with our awareness of the technique, lead us to understand that he did not.

“I don’t ask my neighbors for advice on farming. I can just watch what he is doing and I understand what to do easily.” [SHB-IND-M04]

“I am there to learn from them. There is all the new technology (in Naypyidaw). They are more advanced—they have nothing to learn from me.”

– Farmer and Village Head, Pyay [PYI-IND-M08]

Vignette: Government Training

MOAI has now organised a farmers’ club that invites farmer leaders from local chapters to Naypyitaw to introduce them to new seed varieties, techniques, and equipment. However, this invitation is for the farmers to learn from MOAI, and not vice versa, as the MOAI staff do not inquire about the practicality of new techniques/technologies at the village level, or the efficacy of techniques taught in the past. This mindset, top-down relationship, and relay of information result in both a general lack of interest in adoption on the farmers’ parts as well as the dissemination of impractical techniques and technologies countrywide.

In recent years, with the increase in electrification of rural areas, farmers can now access a new broadcast television network called the “Farmer Channel”. Unfortunately, however, the channel shows mostly propaganda. When we observed a farmer watching the channel during our visit, it was showing a music video in which the actors were singing and dancing, about the joy and hardship of being a farmer.



Above,
Labourers transplanting
young paddy plants

CHALLENGES WITH ADOPTING TECHNIQUES

Dependencies on Labour

Farmers maintain control over land preparation, post-planting maintenance, and post-harvesting activities. However, techniques for transplanting or harvesting increasingly depend on the availability of skilled labourers. Farmers often have to time their nursery planting with the availability of transplanters; coordinating an activity that will not occur until approximately 21 days afterwards. Once the young paddy plant is plucked from the nursery, it needs to be replanted within the next one to two days.

If the transplanters do not show up, the farmer loses all of his plants. Even skilled farmers cannot predict precisely when their paddy will be ready for transplanting, as the plant's readiness depends on environmental conditions that determine how quickly the plant grows. The frustrations associated with the dependency of farmers on labour, especially for transplanting, were widely observed in all three of the locations we visited. In Shwebo, a farmer wished to invent a mechanical transplanter because he cannot control the quality of spacing with human transplanters.

“If I could invent any product, I would get a transplanter. Because with humans, you can’t control how planting turns out.”

– Farmer, Shwebo [SHB-IND-M15]

“If I could invent any product, I would get a transplanter. Because with humans, you can’t control how planting turns out”. [SHB-IND-M15]

We also observed in Pyay that farmers are aware of proper transplanting practices but cannot adopt them, as labourers refuse to adopt these more time- and labour-intensive practices. One particular labour group in Pyay is popular in the community because the group leader was trained in proper transplanting by Japanese agronomists a few decades ago. As we mentioned before, many farmers in Danubyu are switching back to broadcasting due to labour shortages, despite knowing that transplanting is better for the yield and quality of paddy.

Oftentimes the techniques that farmers adopt, though grounded and practical, go counter to proper growing practices. For example, a farmer we met in Shwebo says that she has the transplanters put six plants where five normally would go, in case one does not do well or the workers try to cheat [SHB-IND-F03]. While this may account for sick plants and worker error, it also creates an overly-crowded growing environment in which each plant is getting sub-optimal sunlight and may have stunted growth.

Lack of Infrastructure

Some techniques cannot be adopted unless the existing farm infrastructure is modernised. Many pieces of equipment, such as drum seeders, transplanters, and harvesters, require the farmland be levelled. Oftentimes, farms in Myanmar have not only uneven land but also sandy soil, in which this type of equipment can sink. As many farmers own acreage that is dispersed (not adjacent to each other), different plots of a single farmer’s land can have inconsistent infrastructure. In some cases, roads provide access to some land but not all, posing challenges for a farmer who wants to efficiently utilise certain solutions (namely mechanical) on all of his land.

Irrigation techniques such as the alternative wet and dry method also require having proper infrastructure such as water gates and auxiliary canals. Currently, even when the farmers wish to adopt the technique, pumping water in and out of the farms poses quite a big challenge, as they have no control over water flow.

Contract Farming



Internationally, contract farming is neither a recent phenomenon nor an innovative concept. We have seen the growth of contract farming in all corners of the world in the last 100 years. In Southeast Asia, it has increased quickly in recent decades. For instance, over 90 percent of cotton and fresh milk, and over 40 percent of rice and tea in Vietnam come from contract farming. (United Nations Conference on Trade and Development 2009) Myanmar's recent economic reforms have presented an opportunity for the country to re-engage in international rice export, prompting new practices and organisations to capitalise on the trade.

Private rice specialisation companies have recently begun large-scale contract farming in order to overcome high transaction costs associated with consistently meeting quality standards for export rice. These companies are attempting to optimise farm productivity

For most farmers who work with (the company) Gold Delta, price stability is the biggest value proposition.

and implement standardisation and equipment upgrades at processing points (i.e., mills and upgrade facilities).

Contract farming can be defined as a private firm lending ‘inputs’—such as seed, fertilizer, credit, or extension—to a farmer in exchange for exclusive purchasing rights over the specified crop. It is a form of vertical integration within agricultural commodity chains so that the firm has greater control over the production process and final product. (Prowse 2012)

Rice farming is changing (and has changed) rapidly around the world, with the rejection of age-old practices of raising seedlings, transplanting them into the fields, and threshing, drying, and storing the plants manually. Though modern practices of direct-seed planting via machine and specialisation of services like threshing and milling have

taken hold in many places, traditional practices are still dominant in Myanmar relative to its rice-producing neighbours.

In our research, we encountered examples of contract farming’s foray into Myanmar, via farmers who have engaged with these contracting firms in recent years and via the firms themselves. The specific arrangements are interesting, and vary—from what one might imagine ‘contract farming’ to be—based on practices in other countries. In Danubyu, a small farming town in the upper Ayeyarady Delta with 90,000 acres of rice fields, a company called Gold Delta has been engaging farmers since 2009. The company’s commercial interests are mirrored by altruistic underpinnings, driven by its chairman, U Chit Khine, who is from Danubyu. Gold Delta is committed to providing farmers with a proper seed market to sustain and improve quality, bringing market stability



for farmers with a guaranteed price, and providing working capital to decrease multi-source debt accumulation.

Farmers don't use the term 'contract farming', but rather, refer to Gold Delta as 'the company' or 'the seed seller'. In Danubyu, they often refer to working with Gold Delta as working with 'U Chit Khine', proving that his presence is symbolic, despite his involvement in the on-the-ground operations.

Gold Delta provides an extensive scope of services, including pure seed production; provision of seeds, fertilisers, and working capital; small-scale machinery rental; extension; rice processing; and wholesale trading. What distinguishes it from other traditional 'contract farming' schemes is the company does not enforce exclusive purchasing rights from paddy farmers through contracts. Being one of the leading rice specialisation companies in Myanmar, its economy of scale is large enough to

offer competitive market prices for the paddy farmers, while its close ties to the exporters provide it with immediate access to the foreign market, cutting down the cost of middlemen. Of all the activities in which it engages, the primary source of revenue seems to be wholesale trading.

For most farmers who work with Gold Delta, price stability is the biggest value proposition, as it guarantees a market at time of harvest for the paddy they grow, at a minimum of 4,000 kyats per basket. U Myint Kyi of Thapyay Kone village has continuously bought seeds and sold his harvest to Gold Delta for three years. He cites the degree of certainty over both quality of seeds and predictable prices as drivers, as he and most other farmers in Myanmar have been operating for generations with neither good seeds nor predictable prices. Notably, when gold prices are higher, Gold Delta matches them.

What distinguishes it from other traditional ‘contract farming’ schemes is the company does not enforce exclusive purchasing rights from paddy farmers through contracts.

“They promised to buy at 4,000 kyats but they actually paid 4200 kyats last year”.
[DNU-IND-M06]

One aspect of Gold Delta’s operation that functions more like a conventional contract farm is its seed-growing operation. Farmers who become Gold Delta seed growers earn a higher income (additional profit of approximately 100,000 kyats per 100 baskets) from reproducing and selling back seeds rather than paddy, but must follow the strict standards and guidelines of the company. For example, farmers are required to inspect their paddy plants three times and eliminate weak plants prior to harvesting.

Farm modernisation (the act of moving towards more contemporary farmlands and farm infrastructure) is gaining traction in and around Danubyu, after the MOAI introduced sample plots in 2012. In response to the demand of farmers for the upgrade, and in order to diversify their operations, Gold Delta

has begun facilitating the modernisation of farmland. The company plays a critical role in mobilising farmer agents to help negotiate with farmers, suppliers of machinery to level the fields, and officers from the Land Records Department. While farmers get to retain ownership of their land, their fields become more suitable for mechanisation, effective water control, and an easier transport of the harvest. According to a Gold Delta township manager, the company piloted about 400 acres of farm modernisation sample plots in 2014, and plans to restructure about 800 acres in 2015. There are two villages currently on a waiting list that wish to convert their lands.

“We saw the success of modernisation, much of the levelling of soil.... and how pretty it was when we saw the one hundred acres done by Gold Delta”. [Farmers from a village with 100 acres of recently restructured land, DNU-IND-GRPO4]

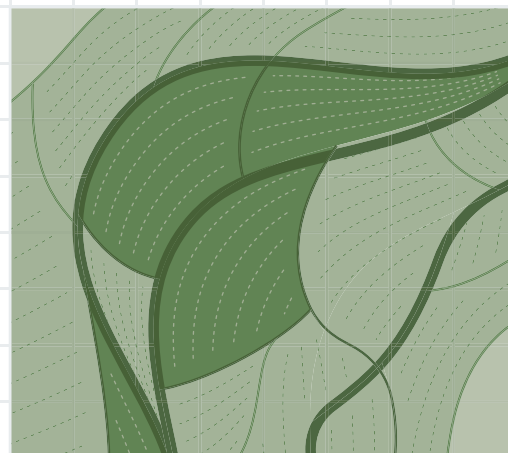
Figure 1.11

Farmland Modernisation

WHAT IS MODERNISATION

Land modernisation is the conversion of traditional, abnormally sized, shaped, and levelled plots of land to be consistently sized and squared. When done properly with proper farming techniques in place, a higher and better quality yield provides farmers with better income and a larger share of export.

Current land modernisation projects being managed by the MOAI are being sub-contracted to private companies. Without maintenance of transparency and professionalism, there is potential for exploitation of practices by large land owners and wealthy individuals, which can result in a bigger gap between rich and poor farmers. There is a question as to how long the government can continue to subsidize farm modernization (even in the small pilot area), and the current trend will be a challenge to maintain long-term without reform of land records.



A single farmer's land can be spread out and intermixed with other farmers.

BARRIERS TO MODERNISATION

COST

Initial investment can be prohibitive to many farmers.

QUALITY OF LAND

There must be 100 acres, and buy-in from each owner of the 100-acre piece of land. A single owner being against it can foil the project.

LEGACY

It can be viewed as disrespectful to alter land that has been passed down for generations.

DISTRUST

Some are worried the government will take their land (a legitimate concern, given the prevalence of land-taking).

TIME

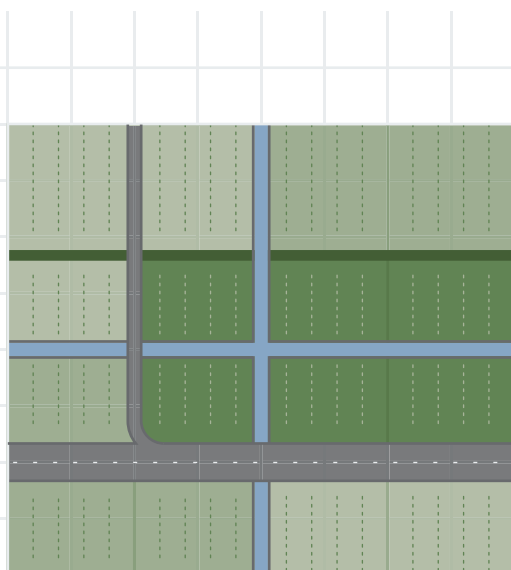
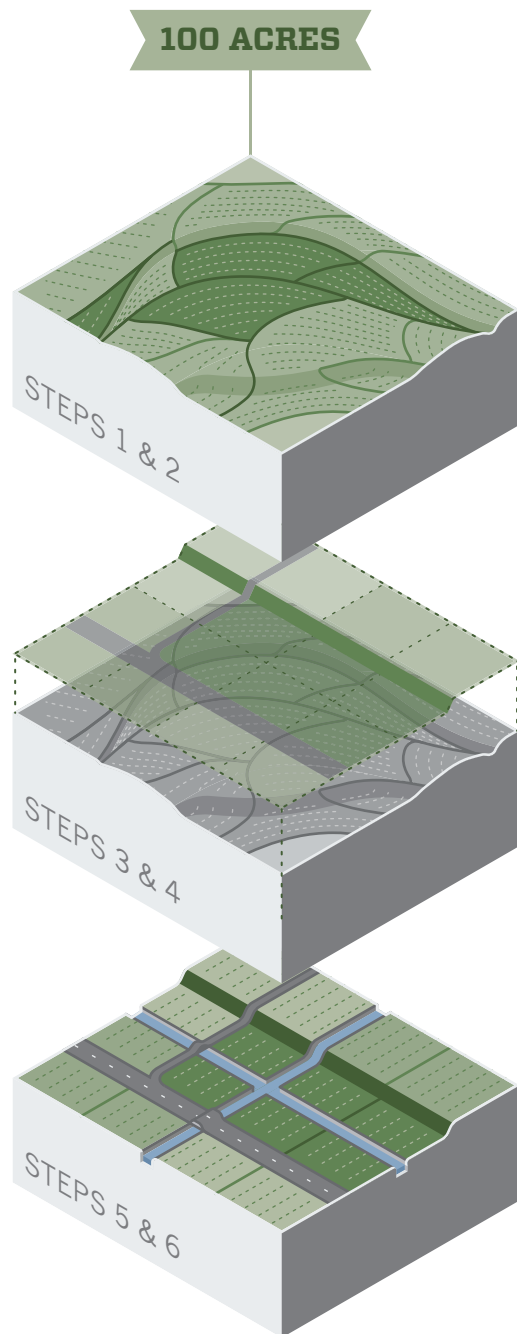
Can cause the farmers to lose a season of farming, which can be detrimental to their income and financial stability if not planned for.

“[Modernisation] is probably overall positive for planting and plowing... but I want to see how it goes with the neighboring village before we consider it for ours.”

-[DNU-IND-M14, Seed Grower]

“The modernization is good for everyone. When everybody sees our farms neat and pretty like this, it gives hope for a better future.”

-[DNU-IND-GRP04, Recently Modernised Farmers]



REQUIREMENTS

Need 100 acres.

Costs 70,000 – 100,000 kyats per acre, depending on distance from roadside, topography of land/difficulty to level, and need for embankment.

Takes about 1 month

Each resulting plot is 0.5 acres

STEPS TO MODERNISATION

1. AGREEMENT AMONGST LAND OWNERS

The farmers are involved in the whole process, making it easier during the reassignment of farmland ownership.

2. MEASUREMENT

Department of Land Records and Settlement and contractors measure the land to verify total of 100 acres.

3. PLOTTING & ALLOCATION

Department of Land Records and Settlement draws up new 0.5 acre plots, which are then marked in the field.

4. LAND LEVELING

Land is leveled/raised up, and embankments are built when needed.

5. INFRASTRUCTURE DEVELOPMENT

Roads, irrigation canals and plots are built.

6. CALCULATIONS FOR DISTRIBUTION

Land records uses a formula to calculate the land each farmer puts in / will receive after the modernisation.

DANUPHYU

In 2012, the MOAI established a model modernisation plot in Danuphyu and 25 other townships in Ayeyarwady Division. They have since begun to convert land in villages gratis.

As farmers have begun to see the benefits of modernisation, other players (namely Golden Delta) have begun to coordinate land modernisation. In these cases, fees are passed onto the farmer. Gold Delta has restructured 1,194 acres to date.

If water management can be done better, “alternate wet and dry method (AWD)” can be practiced. AWD method reduces methane emission and thereby reduces global warming.

POSITIVE OUTCOMES

EASE OF TRANSPORT

Wide and improved roads to bring out paddy mean trucks and other machines can easily go onto farms. Timely transport also reduces post-harvest loss, and increases the likelihood of quality maintenance.

WATER CONTROL

A combination of level land and irrigation canals allows water to be irrigated in and out in a more controlled and timely manner, specifically for the crops being grown. With proper water management, farms can prevent certain pests, diseases and weeds. The plants are ripened at the same time.

CONSISTENT YIELD

Similar conditions and farm sizes make yields comparable from farm to farm.

EASE OF MECHANISATION

Roads and standardised shape and size of plots make it easier to mechanize.

REDUCED RODENTS

As the smaller farms are combined into larger ones, there are fewer embankments and spaces for rodents to stay in.

REDUCED RELIANCE ON LABOR

Improved infrastructure reduces the steps currently required to get paddy from harvested on the field to the mill.

NEGATIVE OUTCOMES

FIRST YEAR YIELD LOSS

~10 baskets per acre due to soil reacclimation

MAINTENANCE*

- Embankments and Canals need to be weeded regularly and rebuilt / maintained after every season.
- Roads need regular maintenance and monitoring to avoid becoming a rodent breeding ground.
- Erosion Prevention: In order to prevent erosion, it's important that perennial vegetable crops are grown, without overshadowing the paddy plants.
- Land Leveling needs to be maintained every year.

LAND SIZE REDUCTION

Each land owner donates part of his land to the infrastructure (roads, embankments) for the 100-acre plot. For each acre, 0.07 acre is lost to infrastructure.

DOWNTIME

Modernisation can take up to a full season to complete, rendering farmers' unable to generate income from their land during that time.

STRICT ADHERENCE TO TECHNIQUES

It's essential that the farmers grow using the right techniques to maintain the land.

RISK OF LAND LOSS

Though we did not hear any stories of farmers losing their land, the Department of Land Records and Settlement is notorious for aiding in illegal acquisitions of land and liberal redrawing of plot lines.

* As farm mechanisation is just starting in Myanmar, it is too early to know the exact costs for maintenance.



Above,
Driven directly onto the
paddy field, a combine
harvester operates as both
a harvester and a thresher,
together in one machine.



Who do farmers trust?

A farmer's world can include a complicated range of influences and information sources. While the extent of each source's influence differs, we have found that across certain variables—namely, propensity to adopt new technologies and geography—there are commonalities to the range and types of influence to which a farmer is most receptive.

Major influencers include personal connections such as family and friends; the village community and opinion leaders such as successful local farmers (to whom we refer as “Influencer Farmers”); salesmen of fertilisers, pesticides, equipment, and other inputs; and experts such as farm extension representatives and agronomists. Market access, proximity to major cities, and networks within these variables are critical influences. Through them, farmers learn about price information to increase their bargaining power with millers, whereas day labourers can discover better-paying job opportunities, leading to migration patterns towards urban areas, which further exacerbate the labour shortages in rural communities. Government programs such as MADB and information projected by government, non-government, and private organisations through the media also play a key role.

Certain players, when present, have significant impact on the practices of farmers. Agronomists (often hired to act as ambassadors for input companies) are able to earn the trust of Influencer Farmers through engagement in their farms. This is accomplished through spending time with farmers and their families to learn their business and their challenges, demonstrating new techniques and practices that directly translate to actions that can be taken by farmers in the village, and using key plots.

“If we don't know the solution, we call the sales person from Awba to diagnose and prescribe”.
[SHB-IND-COU03]

When we look beyond informational influence, we see the impact that access to capital has on the farmers. Notice in Framework 40 that we have sources for formal and informal capital. However, nowhere in this ecosystem are banks or financial institutions, which are becoming increasingly available and accessible in urban areas. We anticipate that, in the coming years, mobile money platforms and services will become quite influential in the lives and livelihoods of farmers, as will the institutions (likely telecom companies) that supply them.

“I started using Buffalo Head fertiliser after learning about it from the doctor [agronomist]. He was very interested in rice protection, and had gone to the US. He came to our village; I trust it more when people come to the village, ... then you know it's a real company. He's been coming for two years, so I trust him”.
[SHB-IND-M09]

“For most farmers, anywhere in the world, whether it's Iowa or Kayin, it's a matter of seeing it. You watch your neighbour. If your neighbour is getting a better outcome and you can imitate it, you imitate it. That's a fairly reasonable conclusion”. [SME06]

“I trust the brokers that I know; they're not strangers”. [SHB-IND-M10]

“People take my advice on things, because they see me doing it, too”. [PYI-IND-M01, farmer and rat catcher]

“For most farmers, anywhere in the world, whether it’s Iowa or Kayin, it’s a matter of seeing it. You watch your neighbour. If your neighbour is getting a better outcome and you can imitate it, you imitate it.”

– [SME06]

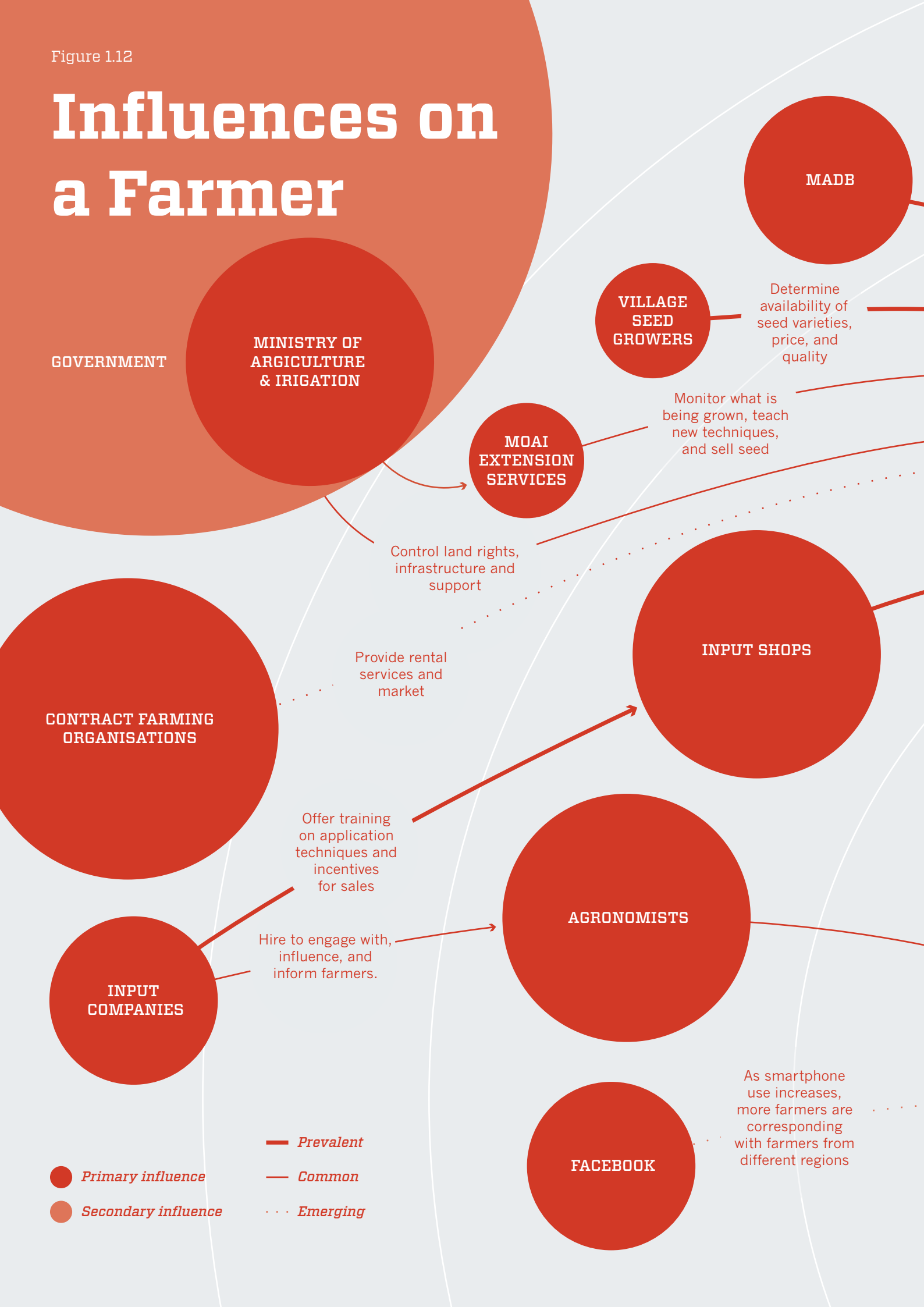
“The Ministry of Rice”

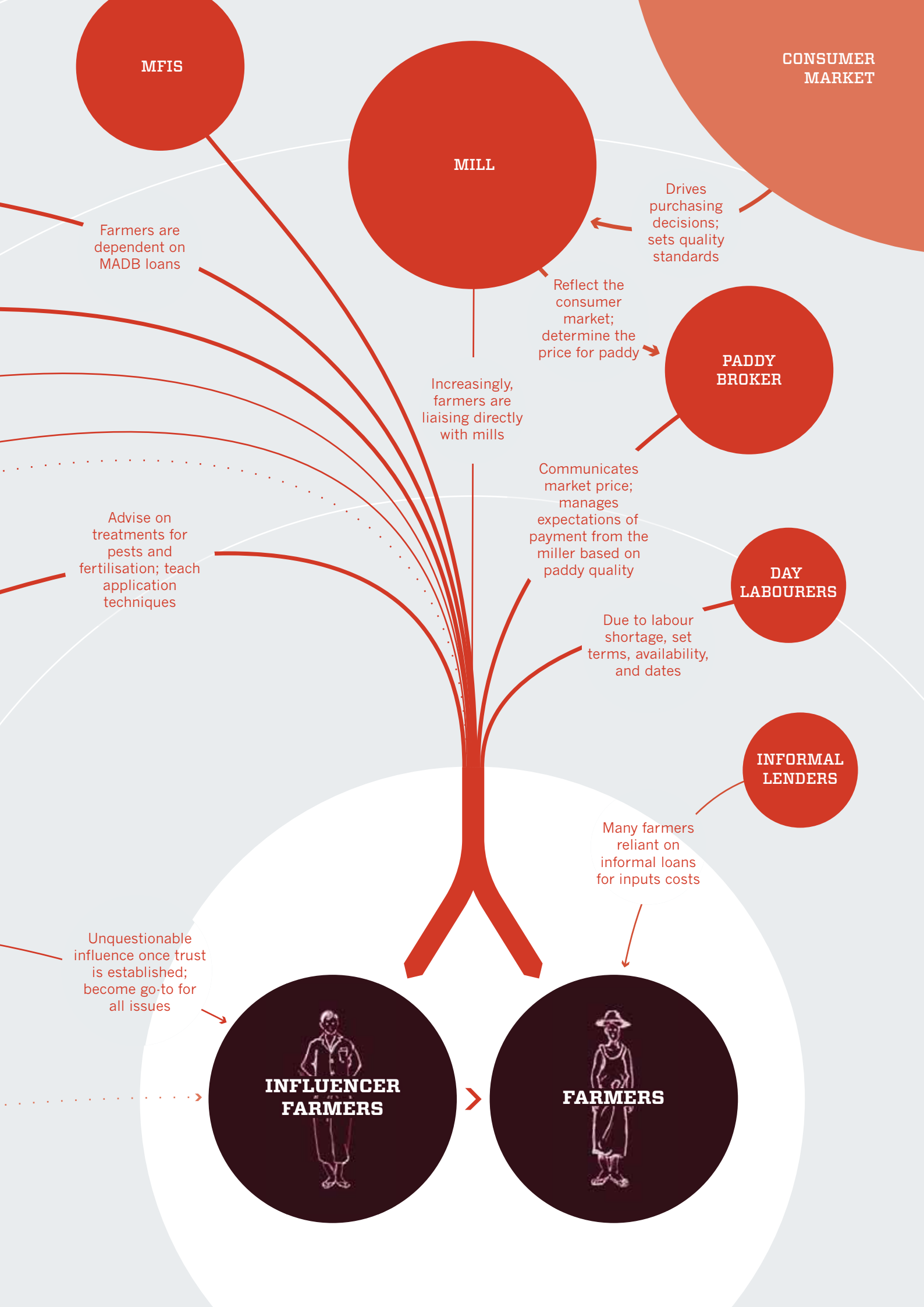
One subject-matter expert described Myanmar’s MOAI as “The Ministry of Rice”, a nickname we heard echoed by sentiments and experiences of many other individuals. Yet, despite the ministry’s narrow focus on rice (versus myriad other, often lucrative* agricultural crops and practices across Myanmar), there is, in practice, a significant disconnect both between the outlook and policies of the MOAI and the practices and realities of farmers and between the MOAI and other ministries, many of which play a pivotal role in the rural agricultural economy (e.g., the Ministry of Fisheries).

*Pulses, for example, are a US\$1B/year crop in Myanmar, with very little oversight and focus within the ministry relative to rice.
[Duncan Boughton, MSU]

Figure 1.12

Influences on a Farmer





What is striking to us isn't necessarily who has the influence, trust, or power, but the directionality of all information towards the farmer. The lack of information and feedback going back from the farmer into the system is perplexing, given the direct correlation between an understanding of the farmer's realities and the effectiveness of information presented. There are limited means for farmers to contribute knowledge into the system, including how they are practicing, the challenges they're having, what the issues are with their land, and how they are running their businesses.



OPPORTUNITY AREA

Re-architecting Extension Services

Both government and non-governmental advisory and extension services can offer regional expertise and scientific know-how, supported by a rise in data from connectivity-related services. The success of these services requires a shift away from “top-down” teaching methodologies towards collaborative and co-creative services, wherein the farmer is both a recipient, and contributor to a larger body, of knowledge.

This model has been proven successful the world over through things like example plots that effectively utilise farming practices that are already in-reach of the community). Building extension services that propagate techniques and information in an interactive and evidence-based way has the opportunity to effectively extend new practices, products, and services into the farms of smallholders.



The background of the page is a blurred image of green leaves, likely from a plant, providing a natural and organic feel to the design.

OPPORTUNITY AREA

Monitoring Farming Practices & Farm Intelligence

Across the world, products and services have improved exponentially as a result of regular and effective user engagement in development and release cycles. Myanmar's late entry into the landscape provides a unique opportunity to involve end users and their assets in the product and software development process, from the beginning. This involvement has the opportunity to not only benefit both product and services companies, through increased value proposition and effectiveness, and the end users, but also to create a bounty of thoughtfully collected data and analytics around farms, farmers, and farming practices.

The relative affordability of modern sensing technologies coupled with the increased prevalence of cellular data connectivity provides a solid foundation for the building of intelligent farming networks and systems to serve both the farmer, through hyperlocal and personally appropriate products and services, and greater Myanmar, by providing an unbiased and ongoing perspective on the state of the ecology, crops, and practices.

The Importance of Locality

At the regional level, we saw an interplay of historical, legacy, economic, and ecological conditions. Physical proximity to markets and big cities was a major influence, and the influx of government and private-company players also affected a region's growth trajectory. Shwebo, Pyay, and Danubyu all differed greatly from each other, with Shwebo concentrated heavily in rice, and Danubyu adapting to adverse deep-water conditions through entrepreneurship and savvy asset management of livestock income streams. We see such developments as progenitors of regional specialisations and possible future core competencies that increase competitiveness and raise incomes.

Shwebo: Paddy is King

"Pathein grows Paw San as well, but compared to our village, yield and quality can't compare because ours is the best. The rice from this village doesn't crack. Other villages follow the fertiliser that we use in our village because some of the fertilisers work so well on our soil. In terms of quality for Paw San, our village is number one". [SHB-IND-M17, Paw San seed grower from the original village]

Two major events have shaped Shwebo and all the players in its ecosystem. The first was the region's variety of Paw San Wei gaining recognition in major cities for its flavor and fragrance, particularly when it received the award for being the "World's Best Tasting Rice" in 2011. (The Rice Trader 2016) The second was the introduction of irrigation to a swath of the local farms, allowing the growth of summer paddy.

These trends have helped many increase their incomes and have further tied the region's identity to rice farming. An influx of private interests, particularly fertiliser and pesticide companies and equipment sellers, all opened up shops to capitalise on the Paw San trend. Some villages we visited were relatively

wealthy, owning more acres of land and relatively more equipment due to the labour shortage. The equipment company Good Brothers decided to open a branch in Shwebo shortly after Paw San came onto the scene, and many farmers can be seen driving around on tractors sold by the company. However, small-acreage farmers do not always receive the benefits of growing the famous Paw San variety, though many aspire to.

We met a seed grower who, like many other farmers, (SHB-IND-M17) finds identity in Shwebo Paw San being the best, but is relatively disconnected from the larger rice value chain and market information. He prided himself on using pesticides as part of his goal of growing the best quality Paw San and staying ahead of the competition. The rise of pest problems in the region is indicative of the pesticide overuse and soil degradation that has resulted from the intensive planting of only a single crop.

Overall, we found Shwebo growing steadily on its namesake rice and benefitting from irrigation, while also being heavily influenced by input companies and value-chain players due to asymmetric information.

“I like to experiment with different varieties of seeds. I also use fertiliser. If I get a fertiliser recommendation, I will try it on a small area first and see if it works.”

– A twenty-five-year-old farmer being trained by the Department of Farm Equipment, Pyay [PYI-IND-GRP01]

Pyay: Willing to try new things

Pyay is a port city situated near a military base. While there, we visited a “model village” that exemplified the potential power of collaboration between farmers through elected representatives, group buying of seeds, fertilisers, and pesticides, and irrigation coordination. Meanwhile, the village down the street was much less organised, so such collaboration existed in pockets, but was not necessarily widespread.

In this region, legacy land rights issues pervade to the extent they influence decision making. Many farmers, now “squatting” on their ancestral lands, will diversify into vegetable gardening because they cannot receive MADB loans without ownership records, and vegetable gardens are more profitable.

Pesticide use in Pyay is less prevalent, and the influence of input shops relatively limited. Many farmers prefer feeding fertilisers to strengthen their plants to prevent diseases. People listen to the advice of input shops, but make their own decisions about whether to follow. Due to shifting land circumstances and unevenness of good paddy land, Pyay

farmers were willing to experiment and try their luck with new things.

“I like to experiment with different varieties of seeds. I also use fertiliser. If I get a fertiliser recommendation, I will try it on a small area first and see if it works”. [PYI-IND-GRP01, 25-year-old farmer being trained by the Department of Farm Equipment]

In some villages, we saw grassroots initiatives fighting against land-grabbing. In another, all the farmers in the village were university educated. A major player in the region was a government seed grower, whose representative had the unique perspective of seeing the on-the-ground situation while receiving direction from the ministry.

Pyay benefits from increased access to information flow from education and the region’s role as a transport hub with China’s border trade and other regions. Additionally motivated by soil issues, Pyay farmers willingly seek more sources of information and investigate new ideas.

“In this year, it is hard to just commit to one thing. You have to dip into multiple things in case one doesn’t work out”. [PYI-IND-M12]

Danubyu: Diversified Income

People in Danubyu proudly claim their proximity to the nation's largest city as "all roads lead to Yangon". Being close to the city is a major influence on farmers in Danubyu, who are highly market aware and business savvy. Major millers, traders, and merchants visit Danubyu farmers often in order to control the quality and quantity of paddy they produce. We met some farmers who grew the varieties that the government/contract farming requested in exchange for having their land modernized.

"I am growing Sin Thukha right now because the government asked me to after modernizing our land for free." [DNU-IND-M10]

Unlike other regions that mostly commit to growing paddy or diversify to only one other kind of crop, a single Danubyu farmer can be engaged in multiple economic activities, from raising pigs and ducks to owning cows that labour in paddy fields to farming fish and catching bee lar (cicada-like insects) when in season.

"My source of income in April is from farming or renting farm land... From July to August, I go finish to increase my income source."
[DNU-IND-M04]

The area is heavily influenced by the presence of deep-water paddyland, making some of the land unusable during monsoon season. Danubyu farmers are used to managing and optimising across all these businesses so that the revenues of one activity feed into starting or maintaining another.



Collaboration: New trends in Myanmar's Rice Industry

With the country experiencing significant growth, there are two movements that will have major effects on the development of Myanmar's rice industry and represent two sides to the same coin: the budding growth of farmer associations and the large-scale spread of contract farming. Both serve as means to unify farmers and increase the efficacy of their practices in order to prepare them for Myanmar's growing presence in the global market.

Farming Associations

Grassroots organising is on the rise, with savvy and connected farmers taking initiative to unify their peers for both political influence and access to markets, goods, and services.

A major challenge to Myanmar's development is the lack of access smallholder farmers have to economies of scale. In past examples, many countries misstepped at this stage of industrialisation, wreaking havoc on the lives of labourers and rural communities as private interests and large-scale production players reaped fast-growing revenues in the name of efficiency during the exponential scaling of their tiger economies.

However, much of the landscape has changed in recent years, as consumers demand accountability and care for those that produce raw materials and inputs for products. "Fair trade" is now a familiar term in many countries and guides the supply-chain policies of large MNC raw goods buyers like Starbucks and Unilever. Myanmar benefits from this shift in consumer attitudes and corporate compliance standards and is positioned to be an innovator in leading healthy economic development that ensures fair share for smallholder farmers.

"In the very near future, MNCs [Multi-National Companies] come in. Nestle comes in for

coffee, they need someone who organises the farmers. Say Unilever wants to purchase tea. But no matter how good the quality is, without certification consumers won't touch it. So you need to go with big brand names, but farmers must have [the] ability to bargain with big companies. With no power they will lose".
[U Tin Htut Oo, former Minister of Agriculture, YOMA Holdings, advisor to U Thein Sein]

We encountered a range of attitudes and efforts aimed at organising farmers. At the grassroots level, different impetuses spawned collective activities. Due to an unhappy legacy of centralised planning during the Socialist regime, "co-op" is considered a dirty word people associate with forced production, labour conscription, and scarcity. We did, however, see variances of friendlier farming associations that emphasize free-will participation begin to take root.

In Pyay, one model village (designated as such by local government officials) had elected representatives that coordinated everyone's irrigation schedules and negotiated bulk discounts on group purchases of fertilisers and seed. This was just down the street from the aforementioned farmers who had been hurt by land-grabbing, and had joined together to take the military to court to regain their lost ancestral lands. We met a man working with a collective savings group located in a village outside of Yangon. With several hundred members, the group had

already accumulated about US\$140,000 in the group fund.

Gold Delta and government initiatives promoting conversion to modernised plots have also been a major influence in getting farmers to gather together. One particularly enthusiastic farmer, DNU-IND-M10, owned nine out of 100 acres was eager for an opportunity to modernise. He gathered the village together to discuss and vote for the conversion.

“The problem before for people who didn't agree at first for the modernisation was that they were scared of the government taking the land, that if the government came and did it they might just take the land away”. [DNU-IND-GRP04 Recently Modernized Farmers, DNU-IND-M10 speaking]

After three years of efforts, the farmer was able to gain a unanimous consensus among villagers. However, even a successful history of villagers working together doesn't always get the ball rolling.

“The village doesn't have regular meetings. We don't like to gather together as a community, each person will go by themselves”. [DNU-IND-GRP04, different man speaking]

Despite challenges, farmer associations are a lynchpin for connecting smallholder farmers with the resources and operational expertise necessary for development. Experts see group organising as a way to increase the voice of smallholders while allowing them to operate effectively as the sophistication of raw materials evolves into more complex value-added activities like food processing. Apart from leadership from the government,

contract farming companies, and NGOs, we see positive growth in grassroots organisations. The Freedom League of Farmers is one such entity. Started in 2013, the organization now has over 300,000 members operating in nine state regions including Sagaing, Mandalay, Mon, and Bago.

“If a farmer comes to the organisation, they can know about all the events from all 26 other townships. It's usually hard for farmers to know of new technologies because they are confined to one location... With the organisation, farmers can know everything from varieties, and weather... The organisation can announce any new things as they come up”. [SME-09-Freedom League of Farmers]

Besides knowledge sharing, the group conducts many other activities. They successfully collected funding from members and negotiated discounts to purchase equipment, including 15 combine harvesters they rented out to villages, with members sharing in the proceeds. At one point in the past, U Thein Aung, the leader of the league, successfully advocated for a farmer-friendly law that successfully passed.

The group also has a set of its own bylaws and a shared values document, on which one of the top lines reads: “Do not blame. Find your own solutions, solve your own problems”.

The development of grassroots organizations like the Freedom League of Farmers is still in its infancy, but developing rapidly. In our interviews with experts and farmers alike, there was much support for smallholder farmers' success, and encouragement to engage actively in directing the growth of their livelihoods. As such, the greatest influence over their future needs to come from farmers themselves.

Figure 1.13

Horizontal vs. Vertical Expansion

A three-acre farmer has no choice but to extend his land because he is otherwise limited in what he can achieve with such a small plot of land. It can take up to five years (of good weather and market conditions) before being able to generate enough profit /savings to buy land and expand to five acres.

With the income from five acres, and without adverse conditions, the farmer has enough money to buy a handheld tractor after two years, at which point a decision needs to be made whether to obtain more land and become a more efficient farmer, or to move up the value chain and become a businessman. The optimal choice depends on factors such as the local market and the farmer's network. Though challenging, a farmer may decide to follow both trajectories.

If at any point there is a significant negative event such as a severely bad harvest, illness in the family, or pest outbreak, the farmer is likely to be set back a number of years.



Reach 5 Acres

After reaching five acres, the farmer can decide how he might like to expand.

10 Lakh Each
(1,000,000 Kyat)

30

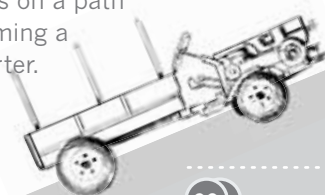
1 Acre plot

30

2 years

Trolley/Trailer

By buying a vehicle such as a trolley, the farmer is on a path to becoming a transporter.



Transporter

Now a transporter, the farmer can extend his network to make connections in the nearby township.

Small Business

Typically the first business venture is an agrochemical store for the village.



5 years

Hand Tiller

A farmer bases this purchase on current crops grown and a desire to use technology to improve efficiency.



More Land

A farmer usually buys one or two acres of land at a time.

+ 2 Acres



Power Tiller

Larger-equipment purchases may depend on being able to rent it out when not in use.



Gross Annual Income

30

Investment

30

30

30

30

30

30

4 years

Small Truck

A small truck increases both the business owner's reach and the size of the loads he's able to transport.



5 years

Paddy Broker

A broker buys paddy from neighboring farmers and sells to mills.



Start Another Business

Moving up can mean starting more businesses, such as a village mill or a retail rice grain store.



8 years

Expand Into a Nearby Township

After the family moves into the township, the children become involved in other entrepreneurial endeavors, including managing the farm.



Total Acreage: 5



Annual Household Income: 5 Lakh



5 years

More land

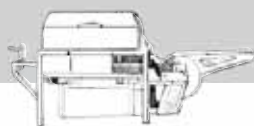
To stabilize his month-to-month income, a farmer will diversify his crops and invest in higher quality land.

+ 5 Acres



Thresher

Only worth buying if the farmer has a minimum acreage of land.



5 years

More land

The farmer takes on more of a managerial role, focusing on operationalising his land and delegating labour.

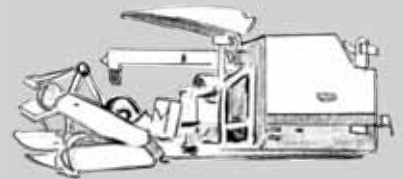
+ 10 Acres



5 years

Combined Harvester

The farmer becomes a more influential person in the village, frequently donating to the monastery and bringing new technologies to other farmers.



Total Acreage: 22



Household Income: 9 Lakh



Alternative Options for Farmers to Diversify Income

Myanmar is at an inflection point of growth, with rice spearheading development alongside a robust outbreak of cottage industries. With the move away from the erstwhile Socialist regime's centralised planning, farmers have new opportunities to diversify their paddyland into other uses, from growing alternative crops to converting into fish farms.

Growth, it seems, can happen along a variety of trajectories. The players and sources of information influencing current farmer mindsets are critical catalysts for such future change. We've seen how information flow greatly influences farmers' choices on what options to pursue, and at times, helps them devise clever investment portfolios consisting of pigs, fishing, and farming activities. Information flow also affects the development of archetypes and communities. This is particularly apparent from the variation in regional adaptations, a first step towards specialisation and development of regional core competencies.

380,000 MMK

The revenue from the eggs of a single duck over the course of 2 years (conservatively, 380 eggs at 100 kyats/egg)

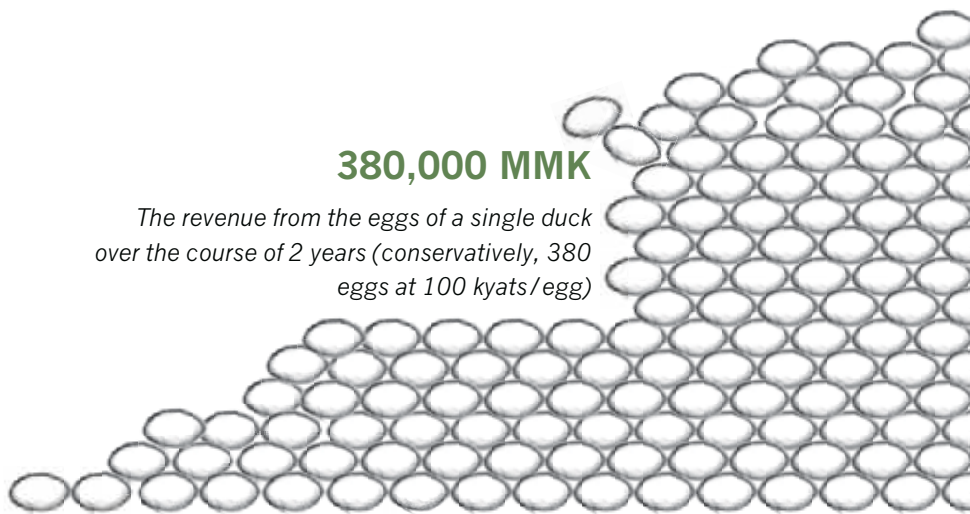
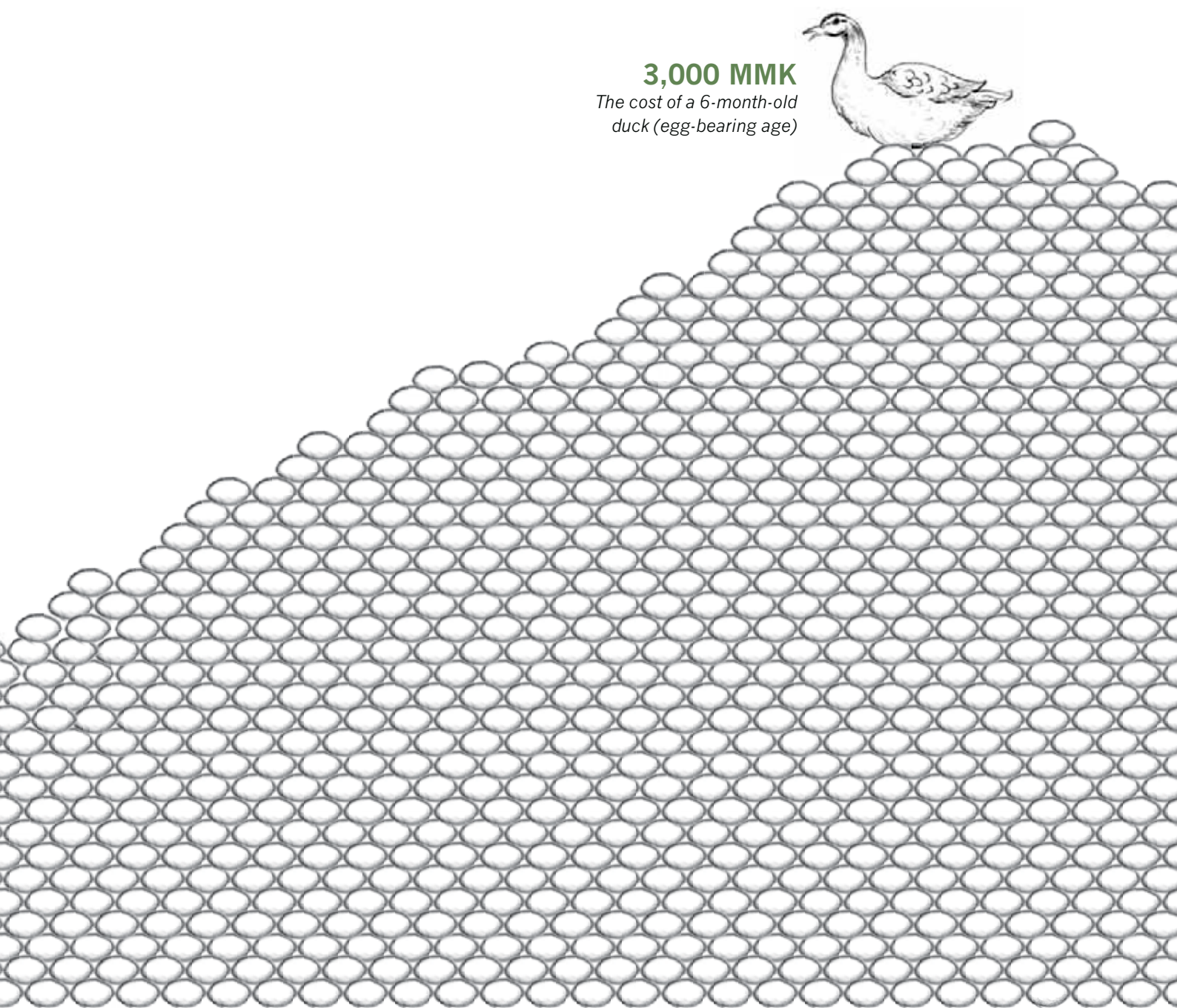
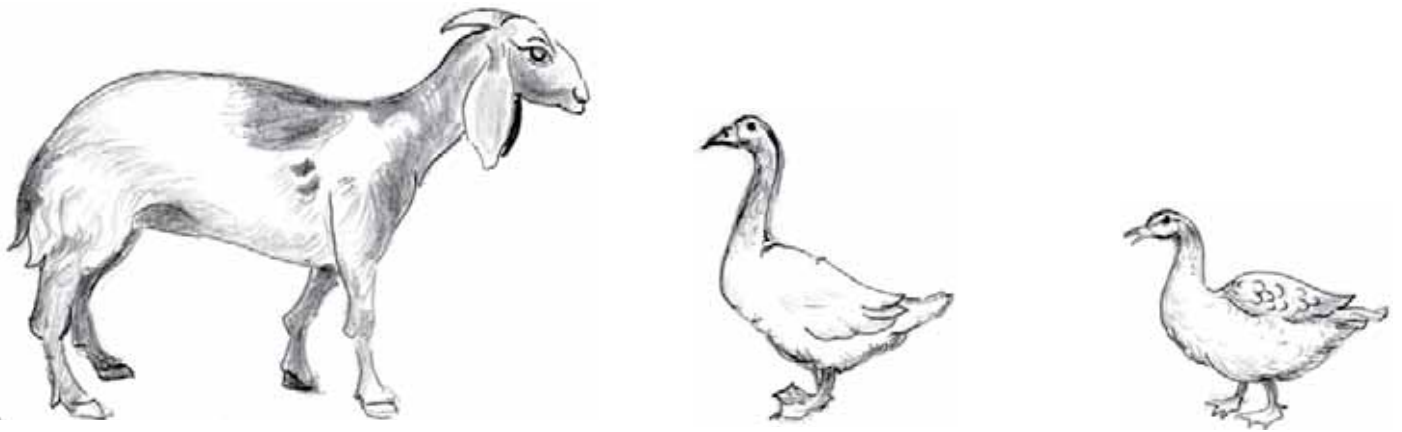


Figure 1.14

Duck vs. Duck Egg

A duck farmer can earn a handsome profit from a well-managed duck egg farm.





In places where soil conditions are not always optimal for growing paddy, we saw a slew of entrepreneurial activity.

One man (DNU-IND-M04) we met in Danubyu was involved in multiple trades throughout the year. His background was in furniture building, which eventually grew into skill sets in constructing everything from houses to boats. As the village's resident handyman, he is currently leading a team that is constructing low-income housing paid for by the government. On days when work is light, he might head over to the city where day labour for construction work can pay up to 5,000 kyats per day. During monsoon season, he spends mornings out in his boat fishing the local flooded streams, earning 2,000 to 3,000 kyats per day, or perhaps work on constructing a few boats he can sell for 55,000 kyat each—up to four in a year, earning a profit of 10,000 kyat/boat. He was also the one who introduced us to the practice of catching bee lar (aquatic insects), which are captured during a short but lucrative season locals engage in annually. Each year, he makes a critical decision whether to farm summer paddy himself or rent the land out to other farmers and fish instead.

"The reason on deciding whether to invest in farming depends on the loan. If I don't have enough money then I'll need to do the loan that's 30 percent interest rate. So it's not worth it. I have to start the nursery in December, so I'll need to decide whether to buy seeds in November. So if there's not enough, I'll rent out my land".
[DNU-IND-M04]

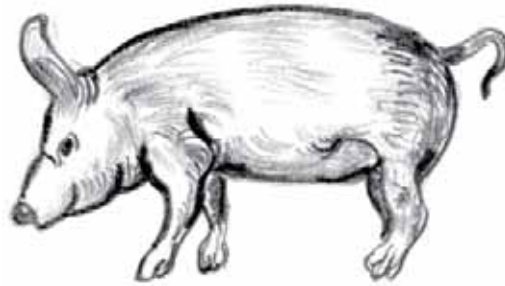
Portfolio Strategy and Resource Optimisation

We met another farmer, DNU-IND-M12, who exemplified the business savvy of many Danubyu villagers in how they managed their resources. To our surprise, their methodologies were fairly complex, comprising a portfolio strategy for livestock and farming management.

"The pigs are my savings. It's a safe investment. If the market price [is] good, I'll sell them. When I sell pigs, I get money to buy a stock of starter fish. I sell duck eggs to pay for fish food".

[DNU-IND-M12, a man who grows paddy with a surrounding moat fish farm. He spends ten months a year fishing and has two pigs, 100 ducks, and three cows that do the ploughing. His aspiration is to convert the whole farm into fish farming.]

While Shwebo remains focused on growing paddy, it is apparent that in Pyay and Danubyu, many farmers want to turn to other, more profitable mainline businesses, such as growing vegetable gardens and converting paddy fields into year-round fish farms. However, credit remains a major limitation. Despite often unfavourable soil conditions, farmers plough away at paddy growing because they could receive financing of one lakh/acre and up to five lakhs from MADB, as well as additional credit available from other sources that vary by region (such as NGOs). In Pyay, many farmers take advantage of the MADB loans for black gram, a much



more profitable crop, despite the smaller loan amount of only 20,000 kyats per acre. Depending on each farmer's use of inputs, black gram, sesame, and vegetables are all options with modest to almost double the profits of paddy, and all with lower initial investments.

"I farm six acres of paddy and two acres of garden. I grow the garden because vegetables are more profitable. But I also farm paddy because then I can get loans from the government". [PYI-IND-M11, a 45-year-old farmer who moved back to the village to take over ancestral lands]

"If it's just doing paddy farming it's not enough. So I do two acres of vegetables. Two acres of vegetables pays better than five acres of paddy". [PYI-IND-M10, a 25-year-old farmer with a bachelor's degree in statistics who reached Level 8 playing Clash of Clans on his smartphone]

Duck Breeding

Some farmers go into duck breeding, which is considered a chore-heavy but profitable business. Unlike crops that require initial investments, are grown for a few months, and then sold, the primary revenue driver in duck farming is egg production. Ducks lay eggs on a daily basis, providing farmers with both daily income from egg sales and an additional source of protein to their diets. However, with a large flock, raising ducks can become a full-time job. A batch of 500

kenyen, just-hatched ducklings, costs 300,000 kyats in Danubyu. Feed is an important input for getting quality eggs with creamy yolks. The farmers we interviewed used various recipes, like combining broken rice, bran, fresh snails, and other nutrient-laden ingredients. The ducks' shelter must be cleaned daily to prevent a rare but disastrous outbreak of disease that can wipe out an entire flock. Additionally, as waterfowl, ducks go swimming daily, necessitating human supervision from a boat during their time in the pond to ensure none are lost, hurt, or escape. Hens are sometimes used to incubate the duck eggs during this aquatic activity.

"It takes a shorter time to hatch duck eggs with hens: 28 days for hens versus 30 days for ducks. Female ducks tend to take breaks more often and they go swimming. Therefore, their body heat is less than that of hens". [DNU-IND-M11]

A careful duck farmer must also ensure a tranquil state of mind for his flock, as adverse shocks can affect egg production.



Duck-breeders often have chickens roost on duck eggs; ducks' bottoms get cool from going in the water, which results in eggs taking an additional 2–3 days to hatch.



A typical duck farmer may have a flock of 500 ducks laying about 400 eggs a day. At 100 kyats per egg wholesale, this equates to a daily income of at least 40,000 kyats.

Many paddy farmers who breed ducks as a side business consider it “fast money”, a way to pay daily expenses or invest in other businesses such as fish farming—which requires heavy daily expenditure for feed. These farmers usually raise a flock of 50 ducks on average, earning about 4,000 kyats a day.

Fish Farming

Of the alternative businesses we surveyed, fish farming is by far the most lucrative, both in terms of percentage profitability and total revenues. Not all farmland is suitable to be converted into fish farms, but deep water areas where monsoon paddy fares poorly are optimal candidates for partial or full conversion, costing approximately 62 lakhs to convert five acres.

Start-up costs are high. A batch of 10,000 baby fish can cost seven lakhs on five acres of converted land and require expensive nets that cost 6.7 lakhs. Duck breeding is often combined with fish farming because duck eggs generate daily income to pay for fish feed. Fish are sold by weight and grow commensurate to how much they are fed, so farmers want to invest in quality feed to grow the biggest fish in the shortest amount of time.

“At least three species of fish need to be raised. They feed at different water levels: some at the top, some at the bottom, some in the middle. Therefore, there will be no waste to animal feed”. [DNU-IND-M11]

Different strategies for optimal feed included using bran milled from a farmer’s paddy; chickpea tofu by-product, which must be purchased every two days due to fast expiration; and precious broken rice, which is not only nutritious but won’t melt away in the water. Farmers often draw loans ranging from 25 to 100 lakhs to cover the gap in fish feed costs, and due to the steadily increasing size of fish and corresponding increase in feed required, many are not aware of exactly how much they invest in feed over the course of the eight to ten months it takes to grow the fish large enough for market. Loans can cost four to eight percent in interest per month, encroaching on a sizeable chunk of first-year profits when combined with the cost of conversion. The annual revenue for a duck operation of this scale is around 60 lakhs.

“When Nargis hit in 2008, it didn’t affect the fish; only the paddy drowned”. [DNU-IND-M12]

Farmers we interviewed often grew paddy and had multiple streams of income from ducks, pigs, and other activities in order to sustain their fish business. They expressed aspirations of converting all their farmland to year-round fish farms because they generate so much income, are much less labour-intensive than paddy, and for the most part are not affected by heavy rain (though in extreme flooding the fish might swim away).

The biggest drawback to farming fish is that it is particularly capital intensive, and revenues are generated only at time of sale. High start-up and maintenance costs and the unease of informally borrowing such large amounts of money are the biggest challenges to this otherwise strong income earner.

night under a light rain, when they could be easily seen flying towards the purple UV lights. Those with good eyes could spot them in afternoon light hiding out among paddy and long grass. Although the local population didn't seem to enjoy eating bilah, those who tried them said they tasted similar to crickets.

Catching Bee Lar

Among the many forms of income-generating activities, one of the more interesting is “catching mermaids”, which we heard about from farmers in Danubyu. The mermaids are actually bee lar, cicada-like aquatic insects that grow from finger-length up to the size of one's hand.

Purportedly sold to the Chinese (and Thai) as a delicacy, they command upwards of 500 kyat for males and 90 kyat for females. A farmer can catch 40 to 50 per day—about 90 percent male and ten percent female—to upwards of 200 per day during particularly high-volume years. When bee lar season (April to May) arrives, villagers eagerly abandon other activities and gather their equipment to catch the lucrative critters. Earning 3.5 to four lakh in average revenues for four months spent on one acre of paddy, farmers can earn the same amount in only fifteen days that bee lar season lasts.

While paddy regularly incurs up to 50 percent in costs, bee lar is almost pure profit (minus the cost of equipment). Each house we interviewed in this village had spotlights or UV lights to attract bee lar. Farmers advised us that the best time to catch them was at





Lifestyle and Outlook: Rural Lifestyle

Myanmar's rural lifestyle is changing, with better mobile connectivity and cheaper solar technology to power basic appliances exposing farmers to the world beyond their villages.

The daily conversations of housewives and teenage girls revolve around the latest Korean TV series. Young men flock to the village tea shop to share the latest news on Facebook or boast about how far they have gotten in their favourite games.

"I know which areas on my trip have good phone coverage, so I'll play my games at those times." [SHB-ADH-M04, Village transporter who is also an avid Clash of Clans fan]



Mobile Ecosystem

The mobile landscape has shifted significantly in recent years, with two 3G mobile networks launched in a single month in 2014 by Oredoo and Telenor to compete with the incumbent, MPT. Telenor's early strategy appears to focus on signing up rural consumers, with Oredoo focused on 3G saturation in townships.

Left,
A farmer heading
out to his fields—the
only place where he
gets reception

In the space of ten months, smartphones have shifted from being a status symbol amongst farmers to becoming a necessary utility, the only exceptions being high-end Samsung and iPhone models. It is common for a reasonably well-off farmer to have a phone for each of the available carrier networks in order to lower barriers to communication (calls within the same network are cheaper) and to receive optimal coverage. Smartphones are prevalent across the farming ecosystem. In fact, they have a disproportionate impact on the farming industry that is inherently geographically dispersed, in a country with relatively poor transport infrastructure.

We expect “mobile literacy” to continue to evolve amongst the rural poor, as consumers discover and appreciate the nuances of connectivity in the applications that are relevant to them, in turn ensuring data takes an ever-growing portion of household expenditures. These consumers for the most part do not consider themselves to be “on the internet” but instead engaged in activities such as “being on Facebook” or “playing Clash of Clans”. As many farm activities require the use of both hands, game play is only possible when performing relatively monotonous and predictable tasks such as transporting paddy sacks on trucks or tending livestock.

These consumers continue to redefine “mobile use”, as a generation of mobile users are growing up with little use for built-in smartphone features such as the dialer or SMS, which have been superseded by Viber, a popular chat and calling application. Battery-heavy smartphone use such as watching movies and playing games continues to be constrained by access to reliable power sources.

TVs, motorcycles, mobile phones, and solar panels are no longer seen as status symbols or “luxury” goods, having become necessities for daily rural life. A group of lady villagers asked us where they could get “stoves that don’t burn their hands” and do not require electricity (i.e., rice cookers and irons that run on solar power and can be purchased at electrical appliance stores in some rural towns.



A close-up photograph of a person's hand holding a smartphone. The phone's screen is visible, showing a date stamp '2015-06-26' and some green foliage. The background is blurred, showing more of the hand and the phone's edge.

OPPORTUNITY AREA

Appropriate Mobile Services

Farmer-focussed mobile products are beginning to enter the scene. However, the lack of consideration for the specific needs of the farmer (e.g., for offline access, hyper-locally relevant content, accessible/non-scientific language) cause most to miss the mark. We have met farmers who use Facebook to follow agronomists or research farm information, and use voice, SMS, or Viber to check market prices. Yet there remains a thirst for more, better (objective / non-sales-related) content and services.



Prevalence of Solar Usage

In 2012, Proximity started selling solar lanterns (supplied by D. Light) that supplanted candles as the major source of light in rural households. Fast forward to 2015, and the cost-efficiency ratio of solar panels and batteries (required to store energy) has advanced to the point where solar is reaching the mass market. The price of a good-quality, 100W solar panel, along with a car battery that can power a household for a full day, costs only US\$150. In some villages in Pakokku township, where there is ample sunshine, there is close to 100 percent solar penetration.

“Farming is survival, not a business.”

– FAS Farm Advisory Service Field Staff, Shwebo [SHB-IND-M01]

Left,
Omnipresent in rural
homes, car batteries
and solar panels
power lights and
mobile phones while
villages wait for
gridded electricity

Myanmar is an interesting lead use-case for solar because its main grid electricity infrastructure is poor, new markets are becoming accessible through better transport infrastructure, and it is close to China. The speed at which prices are being driven down demonstrates the social impact solar is making to this space.

A farmer’s willingness to invest in solar equipment is evidence of his belief that that main grid electricity will not reach his village anytime soon, although it is slowly occurring one to two miles from the main grid, mapping the main travel arteries.

Farmers’ Outlook

“In the next three years, I think there will be less yield and poorer quality due to the overuse of pesticides and fertilisers...If the quality isn’t good, then the price won’t be good. In the future, I want to become a farmer. But I’ll be a farmer of cash crops, like betel leaves and vegetables. Not paddy”. [SHB-IND-M12, an aspiring cash-crop farmer who is currently a broker]

We came across shiny zinc roofs, solar panels, and smartphone-flashing farmers across Shwebo, Pyay, and Danubyu. Does this indicate farmers have become prosperous from farming, and climbed out of poverty? What influences the rural lifestyle change?

On the other hand, we also learned that the fundamentals of the paddy farming ecosystem have not improved significantly,

even though most farmers are having “good” years compared to the post-Nargis cyclone period. The remittances from an increase in rural-urban migration have provided rural families with an additional source of income.

These twin trends: the boom in exposure to the outside world and the stagnant rural economy, are changing the way farmers see their lives. An increase in outside exposure has led farmers to see their deprivation more vividly and evoked their desire to seek greener pastures.

Though we met farmers who are optimistic and hopeful about the future (see Farmer Archetypes), several believe that farming is doomed. Some feel that their children will be deprived of better living conditions if they continue to be paddy farmers. The only content group of farmers were the older generations who have been farming their whole lives and see farming as the only way to make a living. Throughout our travel, we did not meet a single young farmer who was not frustrated.

“Farming is survival, not a business”.
[SHB-IND-M01, FAS staff]

“I’m not interested in farming, and I want to become a businessman”. [DNU-IND-M10, who took up farming two years ago to help out his parents]

GOLLAGENMOB
GENERATION MOBILE

MOB

BROKERS

Brokers work directly for the mills either purchasing the paddy supply or selling the milled rice at a profit from the middle of the value chain. They have the network and know-how to leverage on price and margin. However they too, are often subject to low market prices and poor paddy quality.

We describe two types of broker:

1.

The **PADDY BROKER** who works for the mill to buy paddy from the farmers

2.

The **RICE BROKER** who works for the mill to sell milled rice to the traders.

The paddy broker only works for the mill during harvest seasons while the rice broker works for the mill year-round.

The Middle Men

While they position themselves to the market as being independent, brokers are, in reality, outsourced by the mills to find the suppliers and buyers, and are paid on commission.

Working directly with someone based in a farming village or commercial town saves mills considerable time and money.

"It's easier for the mill to deal with brokers than dealing with a bunch of single farmers". [SHB-IND-M12]

"The farmers who live in remote villages are at a disadvantage because the lack of viable transportation means it is difficult for them to sell paddy on their own, and they don't have any good storage facility in the village. As a result, they often just deal with brokers rather than selling the harvest directly to the mill". [DNU-IND-M06]

"All the farmers' [lives are] dependent on the brokers". [PYI-IND-M15]

Farmers looking to diversify often become brokers in order to earn additional income during harvest time with little up-front financial investment.

Archetype

08



SMALL-SCALE PADDY BROKER

Land Ownership

Five acres



Income Diversification

- Paddy rice brokering
- Duck brokering
- Paddy farming

Outlook / World View

One year



Biggest Challenge

- Commissions dependent on farmers' yields at harvest
- Under intense pressure from farmers to arrange timely transportation or face the risk of losing deals to other brokers
- Liable to pay farmers if the miller cheats

Capital Need/ Loan types

No personal capital investment necessary to do paddy rice brokering

Ko Hla Shwe, 28

Danubyu

Family:

Single; lives with his widowed mother and four sisters

Education:

Seventh grade

Ko Hla Shwe owns five acres of paddy farm, which is not sufficient to support his family. He is always on the lookout for other income sources, which now include paddy rice brokering. He brokers mainly through his miller friend, but also sells to a few other mills as well to maintain his network and reputation with them. During harvest times, Ko Hla Shwe juggles tasks related to harvesting his farm and scouting for information about paddy rice varieties and harvesting times in nearby villages. Keeping track of the various harvest timings is essential preparation.

He bought a mobile phone a few years ago. His main costs are phone bills, fuel for his motorbike, and the cost of sitting at tea shops, where he meets farmers, friends, and other brokers.

Ko Hla Shwe's day as a broker starts with calling mills to find out that day's market price. Although he is supplying paddy rice mainly to his friend's mill, he likes to call up other mills to double-check the price. Since he only brokers two or three paddy rice varieties per season, tracking market price isn't difficult. Afterwards, he drives his motorbike to visit a nearby village to

buy paddy rice from one or two farmers—ideally, 1,000 baskets of paddy rice per day. Once the farmers sell him paddy rice, he has to arrange a truck to transport it to the mill in town. He receives about 50 kyat per basket as commission from the mill on delivery.

Maintaining a good relationship with the farmers and the miller puts a lot of pressure on Ko Hla Shwe. While the millers prefer high-quality rice and push for a lower price, the farmers want to sell off their harvest immediately. Although he sympathizes with the farmers, he has to meet the standards set by the millers as or else they will not take the paddy rice from him. As brokering gets more and more competitive in the villages where Ko Hla Shwe works, he must offer extra services such as preparing paperwork on behalf of farmers applying for MADB loans or arranging for a cash advance through his friend's mill. At the end of the season, he also helps collect the money for the mill.

"When the market price is low, they tell me. If the market price is high, they say they don't know yet. That's how I know the price is high." [SHB-IND-M15]

Brokering Season	Daily Client Volume	Five-day Transaction Volume	Compensation	Mobility	Mobile/ Data Usage
Two months during harvest	<ul style="list-style-type: none">Contacts about ten clients per dayTransacts with one or two clients per dayDeals with new clients every day	1,000–1,500 baskets (500–750 bags)	Earns fixed commission rate per bag	<ul style="list-style-type: none">Travels on a motorbikeBrings money from millers to farmersHeld accountable by farmers; if the millers don't pay, he has to pay out of his pocket	Voice only

Archetype

09



LARGE SCALE RICE BROKER

Land Ownership

None



Income Diversification

Rice brokering
full-time

Outlook/ World View

5 Years



Biggest Challenge

- Constant pressure to chase down buyers to collect prompt payments
- Tax increases and unstable policies at the jetty
- Less frequent transactions when the market price is low, triggering the need to arrange for rice storage on behalf of the mill

Capital Need/ Loan types

Short-term loan
necessary for her
to invest in rice
when the market is
favourable

Ma Sandar, 35

Family:

Married, with an infant son

Education:

High school

“Trust is everything here. If we cannot trust the person, we cannot work with him.”

Taking advantage of her farming background and strong family ties in her native town of Dedaye, Ma Sandar works as a rice broker in Yangon, where she is stationed at Wardan jetty, one of the busiest rice trading centres in the town. She deals with one miller from Dedaye who processes ten to 20 varieties. The miller has created four brands of rice and sells each brand through different brokers for different customer bases. She brokers around 500 bags per week, generating 750 lakhs of sales. When the market is favourable, she also invests in rice on her own.

Ma Sandar had a hard time when she started brokering, until she learned the tricks of the trade. She had to deal with the miller's complaints whenever her selling price wasn't the same as that of the other brokers for the mill. Now she colludes with them for a daily fixed selling price for the miller. Whenever she sells for more than the reported price, she gets to keep the margin on top of her regular commissions.

She is frustrated with her lack of authority over final sales decisions. When the price is low, the miller prefers to wait longer, in which case she must rent a warehouse in Yangon to store the rice sacks — an additional step for her without extra pay. In addition, collecting payment

and transferring it back to the miller is a huge burden. Few transactions are cash sales. Some customers return the next day to pay, while others take up to a month. To avoid the hassle of collecting payment from multiple retailers, she prefers to deal with the wholesalers, whom she perceives to be more trustworthy than retailers, although the former are notorious for making late payments. Regardless of whether the buyers make on-time payments, she needs to pay the miller once a week. She is often forced to pay to the mill out of her own pocket while she waits for the late payments. As it is inconvenient for the miller to travel by motorbike to Kungyangon, the nearest town with a bank, and because of the volume of bank notes she must carry, Ma travels to Dedaye by car.

She aspires to become a rice wholesaler one day. To learn about the market conditions in the country, she actively participates in Facebook rice discussion groups.

Brokering Season	Daily Client Volume	Five-day Transaction Volume	Compensation	Mobility	Mobile/ Data Usage
All year	<ul style="list-style-type: none">– Deals with ten to 20 clients in person every day– Transacts with two clients per day– Deals with repeat clients	1,000–1,500 baskets (500–750 bags)	Colludes with major brokers in the market to keep margins high	<ul style="list-style-type: none">– Stationed at the jetty– Brings money from the traders to millers– Held accountable by millers; if the traders don't pay, she has to pay out of her pocket.	Voice and data

Archetype 08
Small-Scale Paddy Rice Broker



Ko Hla Shwe

Archetype 09
Large-Scale Rice Broker



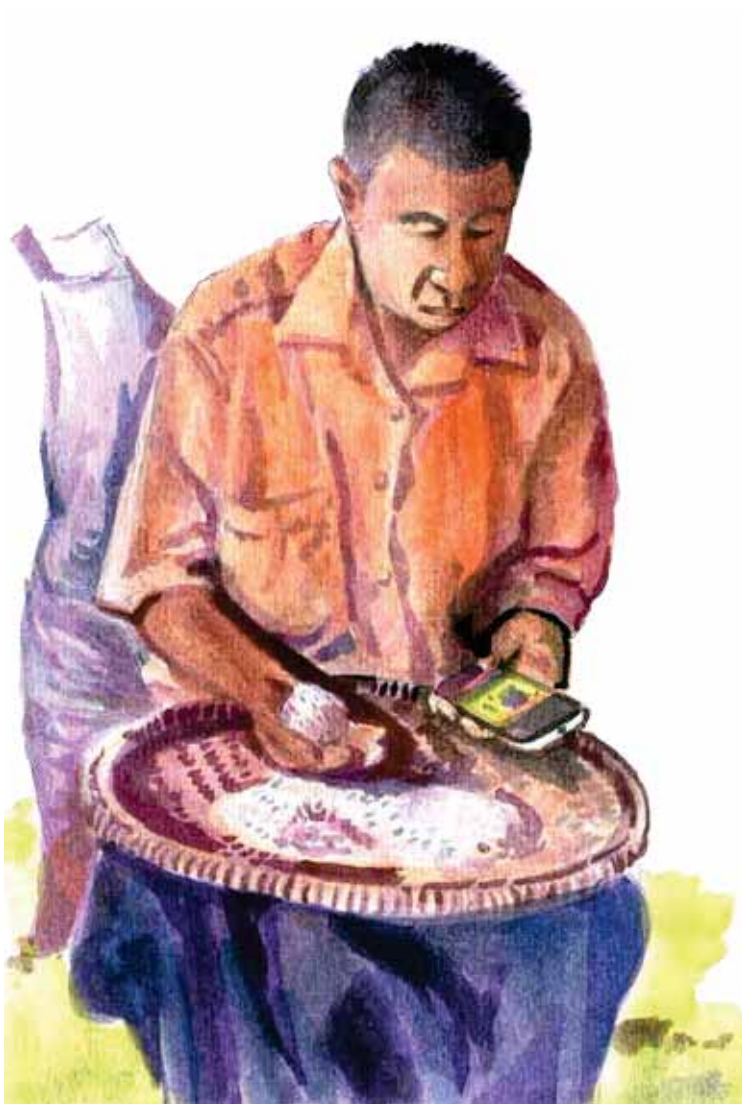
Ma Sandar

	Archetype 08 Small-Scale Paddy Rice Broker	Archetype 09 Large-Scale Rice Broker
Land Ownership	Five acres	None
Income Diversification	<ul style="list-style-type: none"> -Paddy rice brokering -Duck brokering -Paddy farming 	Rice brokering full-time
Outlook/World View	One year	Five years
Biggest Challenge	<ul style="list-style-type: none"> - Commissions dependent on farmers' yields at harvest - Under intense pressure from farmers to arrange timely transportation or face the risk of losing the deals to other brokers - Liable to pay farmers if the miller cheats. 	<ul style="list-style-type: none"> - Constant pressure to chase down buyers to make prompt payments - Tax increases and unstable policies at the jetty - Less frequent transactions when the market price is low, triggering the need to arrange for rice storage on behalf of the mill
Capital Need /Loan types	No personal capital investment necessary to do paddy rice brokering	Short-term loan necessary for her to invest in rice when the market is favorable
Brokering Season	Two months during harvest	12 months a year
Daily Client Volume	<ul style="list-style-type: none"> - Contacts about ten clients per day - Transacts with one or two clients per day - Deals with new clients every day 	<ul style="list-style-type: none"> - Deals with ten to 20 clients in person every day - Transacts with two clients per day - Deals with repeat clients
Five-day Transaction Volume	1,000-1,500 baskets (500-750 bags)	1,000-1,500 baskets (500-750 bags)
Compensation	Earns fixed commission rate per bag	Colludes with major brokers in the market to keep margins high
Mobility	Travels on a motorbike	Stationed at the jetty
Cash Collection/ Payment Nature	<ul style="list-style-type: none"> - Brings money from millers to farmers - Held accountable by farmers; if the millers don't pay, he has to pay out of his pocket 	<ul style="list-style-type: none"> - Brings money from the traders to millers - Held accountable by millers; if the traders don't pay, she has to pay out of her pocket
Mobile/Data Usage	Voice only	Voice and data

Perceived as a “Necessary Evil”

Despite their importance, brokers are perceived to be a “necessary evil”. Both farmers and traders prefer to skip brokers and work directly with the mills because they think brokers take a significant portion of the margin, and also cheat.

The trend of skipping brokers and working directly with the mills is becoming prevalent in Danubyu, especially because of its good infrastructure and its proximity to Yangon.



“I always sell my paddy to the mill directly because I don’t trust brokers. They often cheat farmers”. [DNU-IND-M06]

“It will be great if the big merchants can buy directly from farmers, avoiding the brokers”. [PYI-IND-F03]

“The reporters are coming to catch you bad brokers, you better run!” [SHB-IND-M15]



From the Brokers' Point of View

Although farmers and traders think brokers are making easy money, it's not as easy for brokers as they think. They earn their commission through:

Above,
A broker brings
samples of milled
rice to a trader

Payment Collection: When a broker takes either paddy from the farmers or rice from the mills, he has to guarantee that he will return with the financial equivalent. The paddy broker collects payment from the mill on behalf of the farmer, while a rice broker needs to collect the payment from the traders on behalf of the mill. Both mills and traders are frequently pay late.

"Ninety-nine percent of rice mills have problems with delayed payment". [SHB-IND-M12]

"Some buyers do not keep their promises. They promise they will repay in a week, but sometimes it may take a month or longer". [YAN-IND-M02]

"I can only transfer back once a week. My miller doesn't like it. He thinks I am cheating. He wants the money every day". [YAN-ADH-M03]

What brokers care about

Although the broker works for the mill, he needs to carefully maintain his reputation with farmers and traders. Sometimes brokers in the same market collude to maintain this relationship. Brokers (particularly paddy brokers) also sometimes offer extra value-added services to maintain their reputation among the farmers.

Right,
A trader uses a
kalaung to check the
quality of a broker's
bag of rice

"I was supposed to pay the farmers last Wednesday, but have to wait for the mill. In this case, I have to apologise to the farmers and assure them that they will get paid. On the other hand, I have to push the millers to pay quickly. The mills will make sure to pay us, because they want to make sure they get enough paddy next year. We can put more pressure on the mills than individual farmers can". [SHB-IND-M12]

"I am also a bank loan representative. I take land titles to [the] agricultural bank and [apply] for agricultural loans for the farmers without charging". [PYI-IND-M13]

"The brokers see each other every day, while they only have to deal with the mill when they order rice and send money. So the brokers [would] rather work together [than work] with the miller". [YAN-IND-M02]









Vignette

Transporters: Overlooked Players

Transporters are often overlooked in the rice value chain because they are not directly involved with rice production or distribution. However, many players across the rice value chains have worked with a transporter working in between villages, from village to town or from town to town.

There is no such thing as a specific paddy or rice transporter because a transporter usually does not limit his services to one particular commodity for a very practical reason: revenue generation. Depending on the season, the commodities he transports and his pool of clients change. Therefore, maintaining good relationships with a large network of clients is essential to keep the business going year-round.

“The route to Yangon, I’m just making enough return to cover the trip cost. The return route back to Danubyu is the margin”. [DNU-IND-M09]

Relationship with Brokers

Along the rice value chain, brokers are responsible for arranging transport of paddy and rice to their respective clients, making deals with the transporters to get priority or discounts, and therefore have the closest relationship with the transporters.

“The shipment cost is 350 kyats per bag. But we have been using the same ship company and we send rice bags even when the trading isn’t good. So we have a deal with them. We only have to pay 300 kyats per bag”. [YAN-IND-M02, jetty broker]

It is essential that brokers arrange the logistics with the transporter to send the paddy to the mill the same day as the transaction happens because farmers lack the storage capacity and want the paddy delivered to the mill as soon as possible. If a broker is slow arranging the logistics, the farmer may sell his paddy to a different broker.

“My brother-in-law is a paddy broker. He knows the thresher-owners and gets a heads-up when there is a farmer who wants to transport the paddy to the mill”. [PYI-IND-M12]

Relationship with Millers

An inter-town transporter usually has four or five trucks and hires drivers and driver assistants to operate them, with each typically being assigned to a specific route. In Shwebo, we met a truck driver who came all the way from Loikaw to transport Shwebo Paw San. He works regularly with a trader in Loikaw, who buys from a particular mill all the time. He is not aware of the relationship between the miller and the trader. His duties end when he delivers the rice safe and sound from the Shwebo mill to the Loikaw trader.

Relationship with Villagers

Transporters are very important, even at the village level, as many paddy farms are located far away from roads. Harvest time is their busiest time of the year because every farmer is anxious to transport harvested crops out of the fields as soon as possible to avoid delay in preparation for the next crop or to avoid unexpected rain.

“Farmers have to rent oxen carts or trolleys at a price of 16,000 kyats per acre”. [PYI-IND-M08]

Village transporters operate not only as bus operators but as buyers for the village households. As a truck leaves the village in the morning with stock to deliver, some villagers may hitchhike for a fee to be given a ride to town. If they want to buy goods such as fertilisers and groceries, they can do so without leaving the village because the transporter can bring the groceries back to them. All they need to do is to call the store in town in advance and place a purchase order for the items they wish to purchase.





最大積載量 13100kg

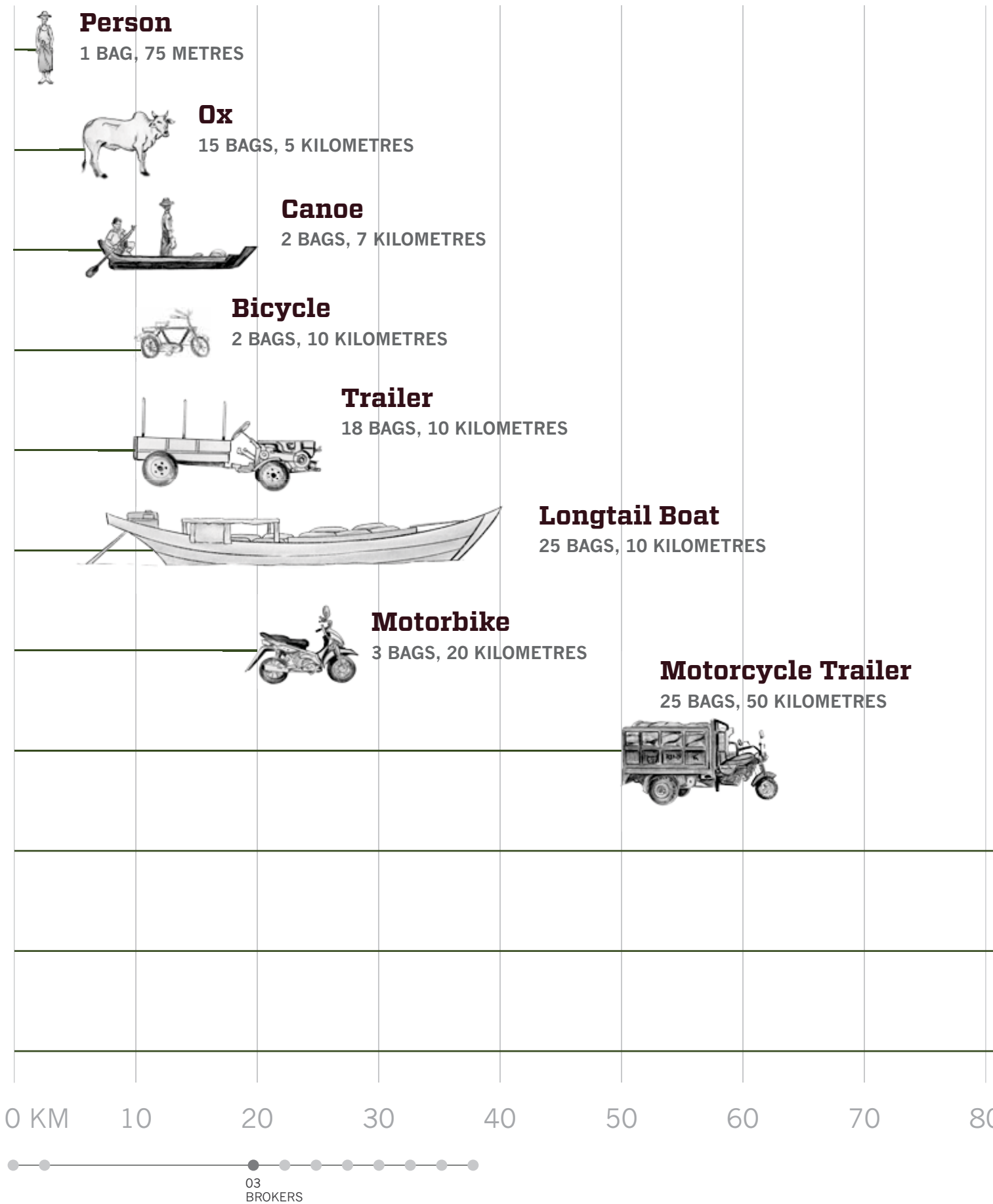
Special
Rice
LIQUOR
ငှက်ဆင်းသုတ်

YG
E-8

FIGURE 2.01

Transporting Rice

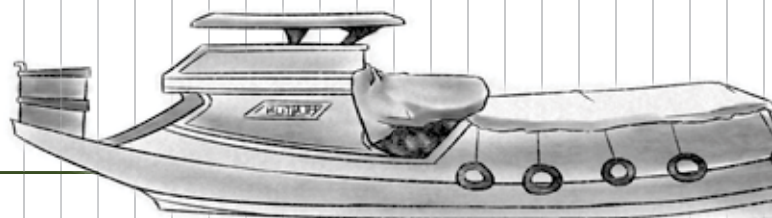
Rice is conveyed in a variety of ways throughout the delivery process. Here we compare the most common ways rice is transported in Myanmar by the number of bags the vessel can carry and the distance it's able to travel.



Heavy Dumptruck
100 BAGS, 100 KILOMETRES



River Boat
1,000 BAGS, 250 KILOMETRES



90

100

150

200

250

300

350

400

Transporter's Risk

The biggest risk for transporters is having to bear responsibility for the goods on their truck. Because there is no insurance mechanism for transporters in Myanmar, transporters are liable to pay for any damaged or stolen items. A single incidence or mishap can drive them into bankruptcy if the items' worth is beyond their financial capacity.

"If I lose or break anything during transport, then I have to pay. Once I had to pay back 20 million kyat for damaged solar panels". [DNU-IND-M09]

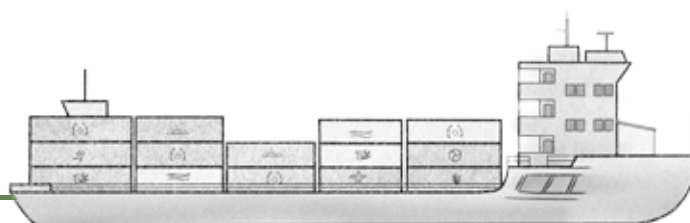
Client's Risk

Clients suffer when the transporters are untrustworthy or inefficient. For example, a fertiliser shop owner in Pyay is frustrated that she cannot maintain a stable inventory of stocks due to the unreliable bus operators between her town and Mandalay. They often leave her goods behind after promising to bring them back for her.

"Mandalay is the crossing point for all routes, and many transportation lines are always busy arranging to send things from one place to another. So sometimes, many packages get neglected or lost". [PYI-IND-F04]



Above,
A truck packed
with sacks of rice,
heading to the
next town.



Barge
1,000 BAGS,
1,000 KILOMETRES



RICE MILLER

Between the farm and the rice market lies the mill, where raw paddy is converted into edible rice. Mill owners also own storage infrastructure for excess paddy and rice. The quality of rice is determined by their process, which in turn is determined by their investment in high-quality milling machinery and operations. As such, rice millers have the power to expose Myanmar-produced rice to new markets.

In some cases, the paddy broker mediates the relationships between farmers and the mill owner, while other times the owners work directly with farmers and the mill owner as the final step in determining the outcomes of a farmer's yield, judging quality, and offering a price.

“There has been no difference in the paddy quality in the last 20 years, only in milling technology.”

—U Myo Thura Aye, Eternal Victory Trading Company





Archetype

10



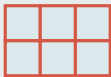
BASIC

RICE MILLER

Land

Ownership

6 Acres of Land



Income

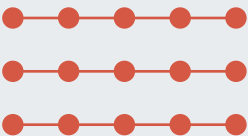
Diversification

- Milling fees
- Margin on paddy purchased/sold to merchants

Outlook/

World View

15 years



Biggest

Challenge

Eminent threat of being thrown out of business by the competition from larger mills with better technology and larger investment

U Kyaw Htin

Family:

Widower with a son
and a daughter

Education:

10th grade

U Kyaw Htin is a second-generation miller, taking over from his father in 1997. The mill is getting a little old now, but his family also owns six acres of paddy. His wife passed away five years ago, and he is raising a daughter and a son with help from his family.

Situated on the edge of Pyay, the mill has a production capacity of up to 100,000 bags of rice per day, and has 5,000 square feet of storage, which is just enough for his own needs, but not really for his customers. He has ten full-time staff and 20 part-timers on payroll. Rice husk is burnt for power, but lack of storage and the mismatch between inputs and outputs revealing the power issues his mill faces, and requiring him to spend a relatively high amount of money on the generator.

He sometimes requires bridge loans, which are sometimes, but not always, available from bank lenders at a reasonable rate. He also borrows from his network of friends in town at three to five percent monthly interest. The cost of a decent rice mill is around 1,000 to 1,200 lakhs, but this rice miller had to settle for an old model rice mill that cost about 500 lakh. The low quality of their machinery sometimes generates additional tasks in the workflow compared to an advanced mill. For example, a good quality de-husker is made with rubber, but his less-expensive version is made with stones so the mill is run for a long period of

time, the stones in the machine chip off and additional manual labour is added to remove the chips.

He's been servicing a regular customer base for many years, but with the improvement in transport infrastructure, the business has extended to owning two trucks. Due to its high quality, the rice is sold for domestic consumption only to Yangon, he has developed close ties with the local markets and traders there. His other close network includes three farmers, regular customers with whom he occasionally spends time when they come to town for rice business.

Living not too far from the city, he is not disconnected from the market prices in town, but is not aware of the importance of rice quality for export. He has paddy growing on six acres of land, with steady yield. He does not venture out to experiment in farming techniques to improve quality and yield due to his busy schedule and running the mill in order to pay back loans and support the family.

Capital Need /Loan types

- Multi-year business loan for upgrading machinery
- Short-term bridge loans at a reasonable rate for seasonal peaks in the milling industry when he needs to pay farmers in advance or increase his inventory, to sell later at higher prices

Quality of Rice Production

25% broken rice

Access to Capital

Limited access to capital from both formal and informal sources

Storage Space

ONLY for mill's own storage:
5,000 square feet
x 1 warehouse

ARCHETYPE 10:



Equipment	Transportation	Payroll
Mill (paddy cleaner, de-stoner, husker, separator, whitener). The quality of polishing sometimes results in chipped stones, which need to be removed manually.	2 trucks	20 part timers and 10 full-time

BASIC RICE MILLER



1
Above Left,
A mill owner gives us
a tour of his facilities

2
Above,
An engine powering
milling equipment

3
Right,
Many mills are still
powered by burning their
own byproduct—paddy
husk



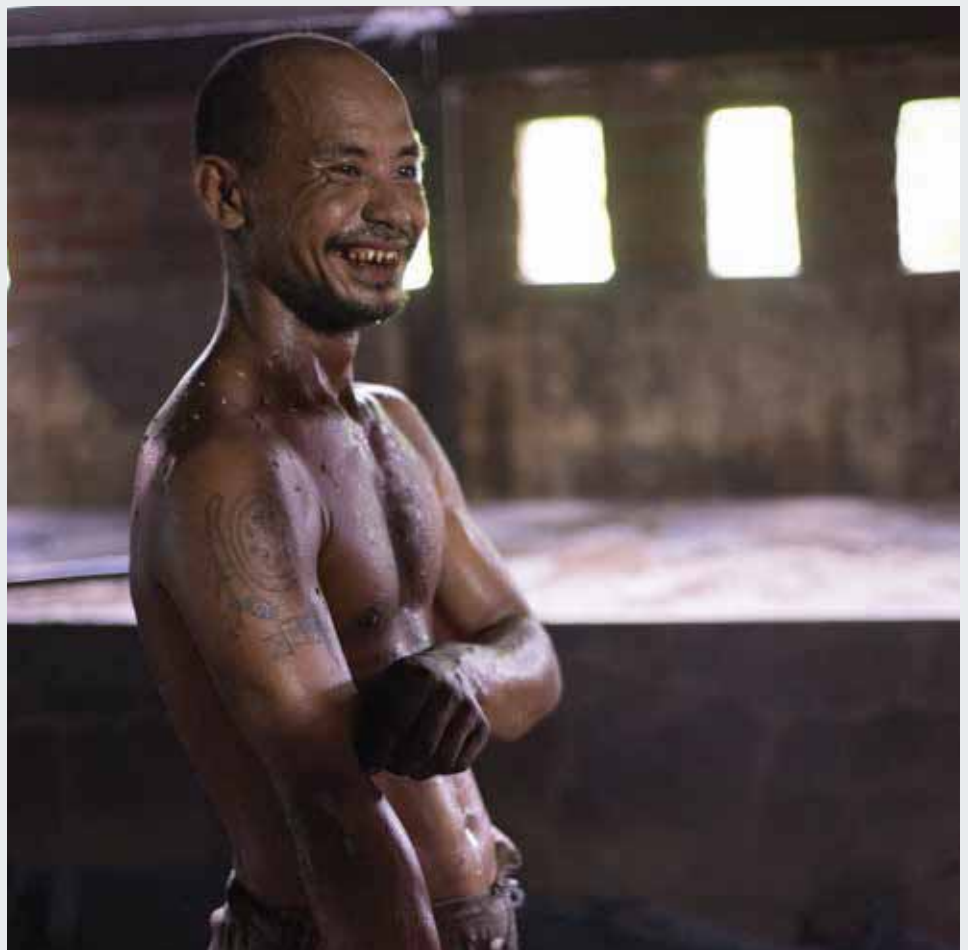
ARCHETYPE 10:



Labourers dry paddy over a heated mesh sheet, then move the paddy for milling



BASIC RICE MILLER





BASIC RICE MILLER



1
Left,
Mills have significant
storage capacity, and often
hold clients' paddy for
months before milling

2
Right,
A bag of milled rice is
sealed using a handheld
sewing machine

ARCHETYPE 10:



While many mills have destoners and other machines to sort paddy or rice from debris, many more basic mills still rely on manual labour

BASIC RICE MILLER



Archetype

11



ADVANCED RICE MILLER

Land Ownership

80 Acres of Land

Income Diversification

- Milling fees
- Margin on paddy purchased/sold to merchants
- Growing paddy

Outlook / World View

30 years

Biggest Challenge

Occasional paddy supply shortage in non-harvest periods; the mill needs to operate year-round as there are 50 full-time labourers on payroll

Capital Need / Loan types

Multi-year business loan for expansion

U Maw Gyi

Family:

Family of three with an only daughter

Education:

University degree

U Maw Gyi founded the Shwe Toe mill in 1995, pooling capital from his various financial interests, including 80 acres of farmland that he owns. He and his wife have one daughter aged 14 who occasionally helps out with the daily operations of the business. Located in close proximity to Danubyu, the mill is capable of producing 2,000 bags, of which 1,800 bags are pure rice, and has 50,000 square feet of storage. He has 50 people on payroll and another 50 working daily in morning and afternoon shifts. About half of the staff are manual labourers overseen by a foreman, and the rest are involved in operations, quality control, and other aspects of running the mill. His mill burns husks for some of its power and maintains a generator for when the electricity main goes down.

He sometimes extends credit to farmers and offers low-interest loans to key customers. Farmers may also store sacks of paddy at the mill's warehouse free of charge with no limitation on volume, as long as they don't exceed the total capacity of the mill's storage size. This enables farmers to achieve a higher selling price and mill only when the market is high. U Maw Gyi is personable, and devotes time to getting to know his farming customers, attending their children's graduations, and even taking their relatives to the hospital.

He proactively goes after new business, and has recently been scouting for opportunities to export. U Maw Gyi is very keen on upgrading his rice quality and pays close attention to the export standards. He also has a clear vision of how his mill can contribute to improving the quality of paddy to mill high-quality rice. For instance, he believes farmers need "better farming technology, fertiliser, and loans in addition to a set standard of paddy quality for them to cultivate". Furthermore, he upgrades his machines every two years, and procured a rice polisher and colour sorter as his first investments towards milling export-quality rice.

The mill is situated 60 kilometres from Yangon, with paddy transported in daily on the mill's fleet of four trucks, with an additional five trucks rented from a local transporter colleague. A nearby jetty supports easy export to China. He's been approached by private investors but doesn't currently see an advantage in diluting his ownership. Being a thriving mill means he is often pitched the latest technology, techniques, and varieties of rice.

Quality of Rice Production

5%-25% broken rice

Access to Capital

- Family money
- Private banks
- Large personal network from which he gets a slightly better interest rate
- Private investors approach him

Storage Space

Available storage for mill patrons: 5,000 square feet
x 10 warehouses

Equipment

- Mill (paddy cleaner, de-stoner, husker, separator, whitener)
- UV colour sorter
- Polisher



1
Above,
A sample supplied
by a paddy broker
is evaluated

2
Right,
A mill owner
shows us defects
in rice that affect
quality, and
market price

Transportation

4 trucks, with and
additional 6 rented
in town on an as-
needed basis

Payroll

50 employees on
payroll, with another
50 working daily in
morning and afternoon
shifts



OPTICAL

SORTER



The digital
interfaces of the
modern miller's
equipment starkly
contrast their
analogue counter-
parts

OPERATION MODE		DISCOLORED N CHALKY			
MODE CHANGE		RUN		STOP	
REMOTE MONITOR		HOPPER SENSOR		DATE TIME	
POWER OFF		OFF			
FEEDER OFF		Flow Rate PRI		73	SEC 65
		SENSITIVITY			
		D. PECK PRI		83	SEC 70
		CHA - LKY PRI		85	SEC 72
		D. PALE PRI		83	SEC 70
POWER OFF		VERSION		VARIETY CHANGE	
				ALARM MONITOR	





Miller Archetype 10
Basic Miller



U Kyaw Htin

Miller Archetype 11
Advanced Miller



U Maw Gyi

	Miller Archetype 10 Basic Miller	Miller Archetype 11 Advanced Miller
Land Ownership	6 Acres of Land	80 Acres of Land
Income Diversification	<ul style="list-style-type: none"> - Milling fees - Margin on paddy purchased/sold to merchants 	<ul style="list-style-type: none"> - Milling fees - Margin on paddy purchased/sold to merchants - Growing paddy
Outlook/World View	15 years	30 years
Biggest Challenge	Eminent threat of being thrown out of business by the competition from larger mills with better technology and larger investment	Occasional paddy supply shortage in non-harvest periods; the mill needs to operate year-round as there are 50 full-time labourers on payroll
Capital Need /Loan types	<ul style="list-style-type: none"> - Multi-year business loan for upgrading the machinery - Short-term bridge loans at a reasonable rate for seasonal peaks in the milling industry when he needs to pay farmers in advance or increase his inventory, to sell later at higher prices 	Multi-year business loan for expansion
Quality of Rice Production	25% broken rice	5%-25% broken rice
Access to Capital	Limited access to capital from both formal and informal sources	<ul style="list-style-type: none"> - Family money - Private banks - Large personal network from which he gets a slightly better interest rate - Private investors approach him
Storage Space	ONLY for mill's own storage: 5,000 square feet x 1 warehouse	Available storage for mill patrons: 5,000 square feet x 10 warehouses
Equipment	Mill (paddy cleaner, de-stoner, husker, separator, whitener). The quality of polishing sometimes results in chipped stones, which need to be removed manually.	<ul style="list-style-type: none"> - Mill (paddy cleaner, de-stoner, husker, separator, whitener) - UV colour sorter - Polisher
Transportation	2 trucks	4trucks, with and additional 6 rented in town on an as-needed basis
Payroll	20 part-timers and 10 full-time	50 staff on payroll and another 50 working daily occupying morning and afternoon shifts



Determining Paddy Price

Above,
Mill workers show
us how they
determine the price
they will offer to
farmers for their
paddy.

Every harvest, mill owners go through the process of purchasing paddy from farmers and paddy brokers. The success of their business is determined by their ability to conduct visual, physical, and digital tests for moisture content, purity degree, and yield of paddy.

Whether they wish to buy the paddy and what they would pay is initially based on the expected ratio of paddy to rice, as well as the quality of the grain behind the husk. While farmers think and sell in terms of baskets—a rate that is set by the government, as one basket is equal to 55 pounds—millers calculate in terms of pounds, with a single basket generating between 46 and 60 pounds.

Figure 3.01

How to Measure Rice Quality and Yield

MOISTURE

13-14%

TARGET MOISTURE

The first step in determining whether paddy is in good shape and will result in a good ratio of rice-to-paddy is to test its moisture content.

If paddy is **too wet or moist** when processed, it becomes weak, and will often break apart into lower-quality grains under pressure in the mill. Although far less common, rice that's too dry is also a challenge as less-dense rice is more brittle and commands a lower price per weight and is more brittle, though it is far less common for rice to be too dry. Wetness contributes significantly to the quality and resulting price of milled rice. Thus, farmers selling too-wet paddy will be underpaid.



Brokers and farmers are experienced in testing out paddy's moisture content in analogue manners, such as:

- 1 **By sight:** to see if there are any signs of swelling, fungus, or mold
- 2 **By chewing on it:** to feel the density and brittleness
- 3 **By striking it on the ground:** how the paddy shell breaks on the ground indicates how soft or brittle they stick
- 4 **By squeezing it in one's palm:** to see how it sticks, how the grains react to each other and how much it sticks together

Millers, however, are more precise (as their profit depends on it). They use a piece of equipment called a moisture sensor, which picks up the moisture content inside a small amount of paddy and displays it digitally on a screen. A moisture content of 13–14 percent is ideal, lower than 13 percent is too dry, and higher than 14 percent is too wet.

PURITY

<25%

BROKEN RICE



High-quality rice depends on consistently high-quality paddy.

As farmers face challenges maintaining the purity of the variety of their crop, the mill will price their paddy accordingly. As rice mills are built to process one variety at a time, mixed varieties interfere with the mills' functionality; thus, producing a higher percentage of broken rice and a less varietyally-pure end product.

The percentage of the broken rice content can be determined by filtering the rice on a filter plate. Domestic-quality rice typically contains ≤ 25 percent broken rice, whereas, export-quality contains ≤ 10 percent (depending on the standards of the country).

Inspecting the paddy's grain dimensions for consistency (visually or with calipers / a rule) is done as a primary check that the seeds are consistent. The miller or broker determines the purity degree by looking for consistency across size shape, and colour of the paddy grains. In order to more accurately determine the broken rice content, millers will sometimes use a mini (tabletop) rice mill, creating a sample of the broken rice yield of a specific sample of paddy.

YIELD

<40%

WHOLE GRAIN

The aforementioned a mini (tabletop) rice mill produces a similar output to its larger cousin, along with a representative yield of other outputs and byproducts (such as husk). A good quality paddy will yield a 40–50 percent rice content relative to the paddy put into the machine. Should there be less than 40 percent of rice or more of the by-products such as broken rice, weeds, red seeds, rocks, or bran, the paddy will be considered lower quality, and a lower price will be paid to the farmer.

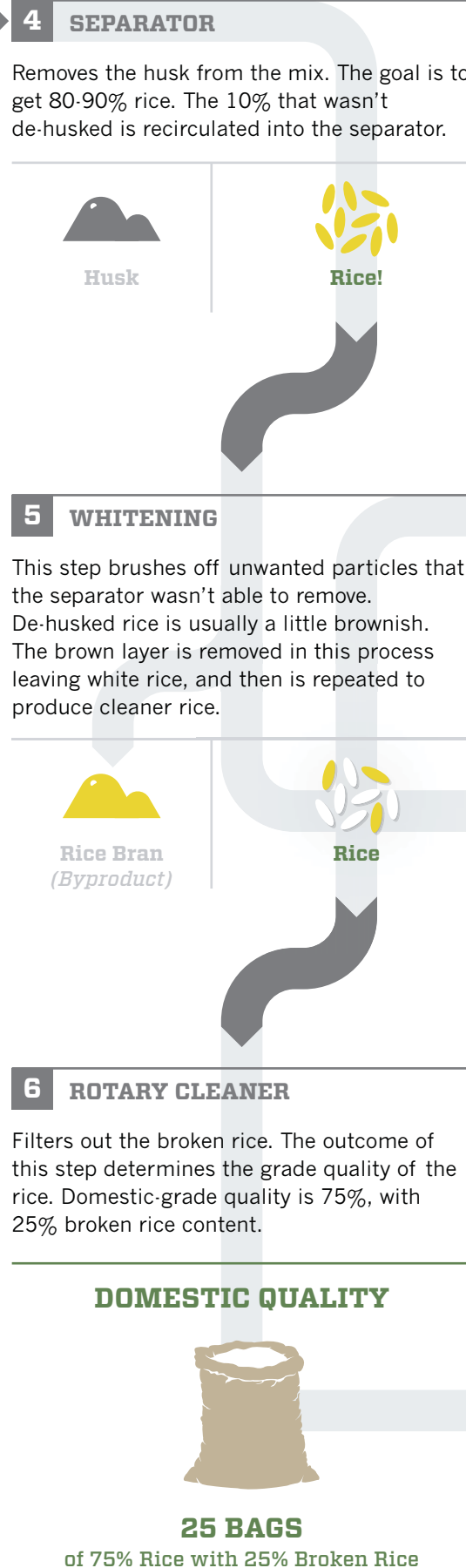


Figure 3.02

Anatomy of a Mill



The first step milling starts with a husker made of rubber that de-husks the paddy seeds..



BONUS : STEPS FOR EXPORT QUALITY

7 POLISHER

This will be the first step in upgrading the 75% domestic-grade quality rice. A polisher uses moisture twice to make the milled rice shiny.

8 ROTARY CLEANER

Passing the rice through another rotary cleaner ensures less broken rice, thus improving its overall quality.



9 UV COLOR SORTER

The last step to producing 90-100% grade quality rice is to sort out yellow seeds from the milled rice. The rice should be pure white rice and nothing else.

EXPORT QUALITY

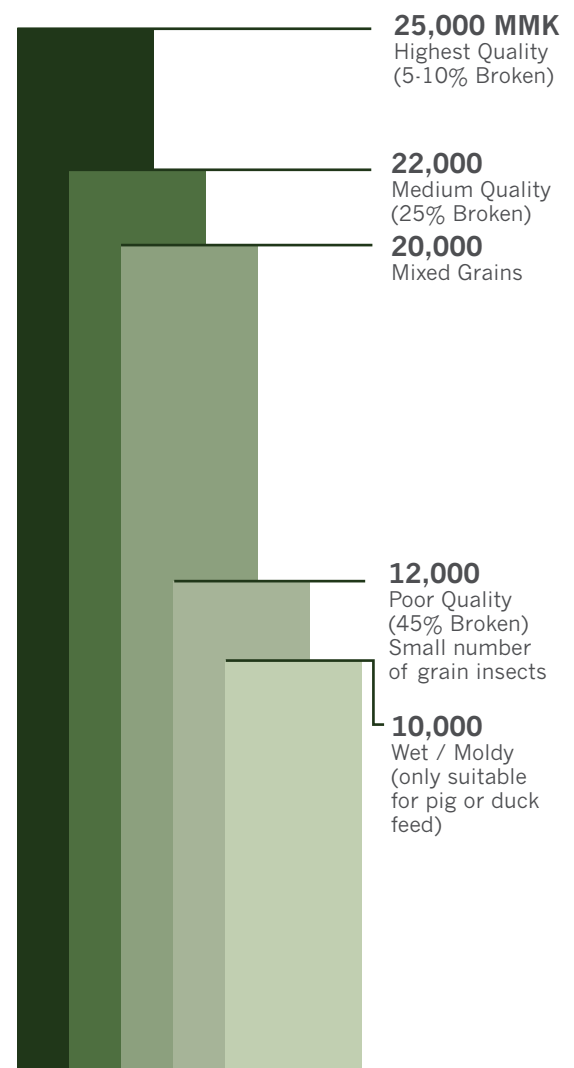


18 BAGS

of 90% Rice with 10% Broken Rice

Figure 3.03
**Varying Sale Price
for Average-Grade Rice**

A single rice variety can command several different prices depending on how it is processed. The first determining factor (and the factor by which it is measured and sold) is the ratio of full grain to broken grain. It is common to find 25 percent broken rice at the higher end for domestic consumption as well as for export, and other ratings for export ranges from zero to 15 percent broken rice.



Price per bag, based on July 2015 prices for Shwe App rice, grown in the Inle region of Shan State.





Paddy husks form
a landscape outside
of a mill

Rice quality in the market

Through the use of advanced machinery, the miller aims to maintain a consistent quality of rice output regardless of the consistency or quality of input. With inward investment, this is becoming easier.

Right,
A mechanical sieve
sorts broken rice
from full grains

"Quality has improved because rice mills have improved". [DNU-IND-COU01]

Up until 2005, it was only possible to achieve a quality of 35 to 50 percent broken rice, and the market was restricted to domestic consumption. Today, mills in Myanmar have achieved 25 percent quality for most domestic consumption and 15 percent or slightly lower for Yangon residents and international consumption. Without local harvesting quality standards in place, mills find it difficult to find sufficiently high-quality paddy, with a wide variety of rice quality found within the country. The formation of a formal legal and export policy dictates a formalisation of rice quality standards that is welcomed by mill owners exploring new markets, despite a greater capital investment.

"An assessment standard set for rice to be exported will help every player involved in the rice value chain since the mills will mill better quality rice, merchants will buy good paddy, and farmers assure the quality of their rice". [DNU-IND-GRP01]

The Business of Milling

Processing paddy into rice is a multi-stage process that requires sorting, shucking, and polishing—sometimes multiple times for each of these steps. Mills that lack the machinery to produce high-quality rice can produce edible-quality rice, which is either sold at a lower price for consumption or bought and then processed by another broker or merchant.

Like the farmer, the mill owner often has limited information and capital. New machinery is not only difficult to come by but also difficult to obtain, as almost all equipment manufacturers operate in English or their native language, often Japanese or Chinese. Furthermore, mill owners constantly need to make big decisions without control over the supply (which depends on the farmer's yield) and limited control over the market (smart millers know how to use relationships with traders and retailers to their advantage). They make their profit through value-added processing, built-in warehousing that allows them to store both paddy and rice to mill and sell at peak market times, and the sale of paddy they have procured for themselves.



FIGURE 3.04

Reasons for Mixed Rice Seed

There are two very different reasons for mixed seeds.

Intentionally Mixed

Customized Customers

Some customers like to mix up attributes from different varieties
Traders sometimes create new rice names based on the mix.

Paw San = soft but expensive
Nga Kywe = rough but cheap

By mixing the two grains, the customers can customize their taste preference and price range.

Greedy Traders

Sometimes, traders like to increase margins by mixing higher quality rice varieties with lower quality rice varieties.

For example, traders mix Paw San with Ayar Min because the two varieties are very similar in appearance, and then it as Paw San.

PAW SAN + NGA KYWE



PAW SAN + AYAR MIN



Unintentionally Mixed

Careless Millers

While milling different batches of paddy varieties, the millers need to go through a cleaning process to ensure every paddy variety is milled purely.

However, some millers skip the cleaning process because it costs time and labor. Hence, the final rice is mixed up with different varieties at the regional level. However, this mix-up can be easily spotted as the two different rice grains will look different (e.g., Paw San mixed up with Ma Naw Thu Kha).

PAW SAN + MA NAW THU KHA



Unprepared Farmers

Farmers usually lack sufficient capacity to store the seeds separately by varieties out in the field. Hence, many seeds get blown away by the wind and eventually get mixed up.

There are a number of cross-pollinations that occur during the crop season (e.g., one plant may be longer while another is shorter).





The background of the entire page is a photograph of a wooden mill. The mill's structure is made of dark wood, and its interior features a series of horizontal wooden slats or grates. A prominent white rectangular text box is overlaid on the upper half of the image. The text within this box is in a dark red or maroon color. The overall lighting is somewhat dim, with a brighter area on the left side of the mill's interior.

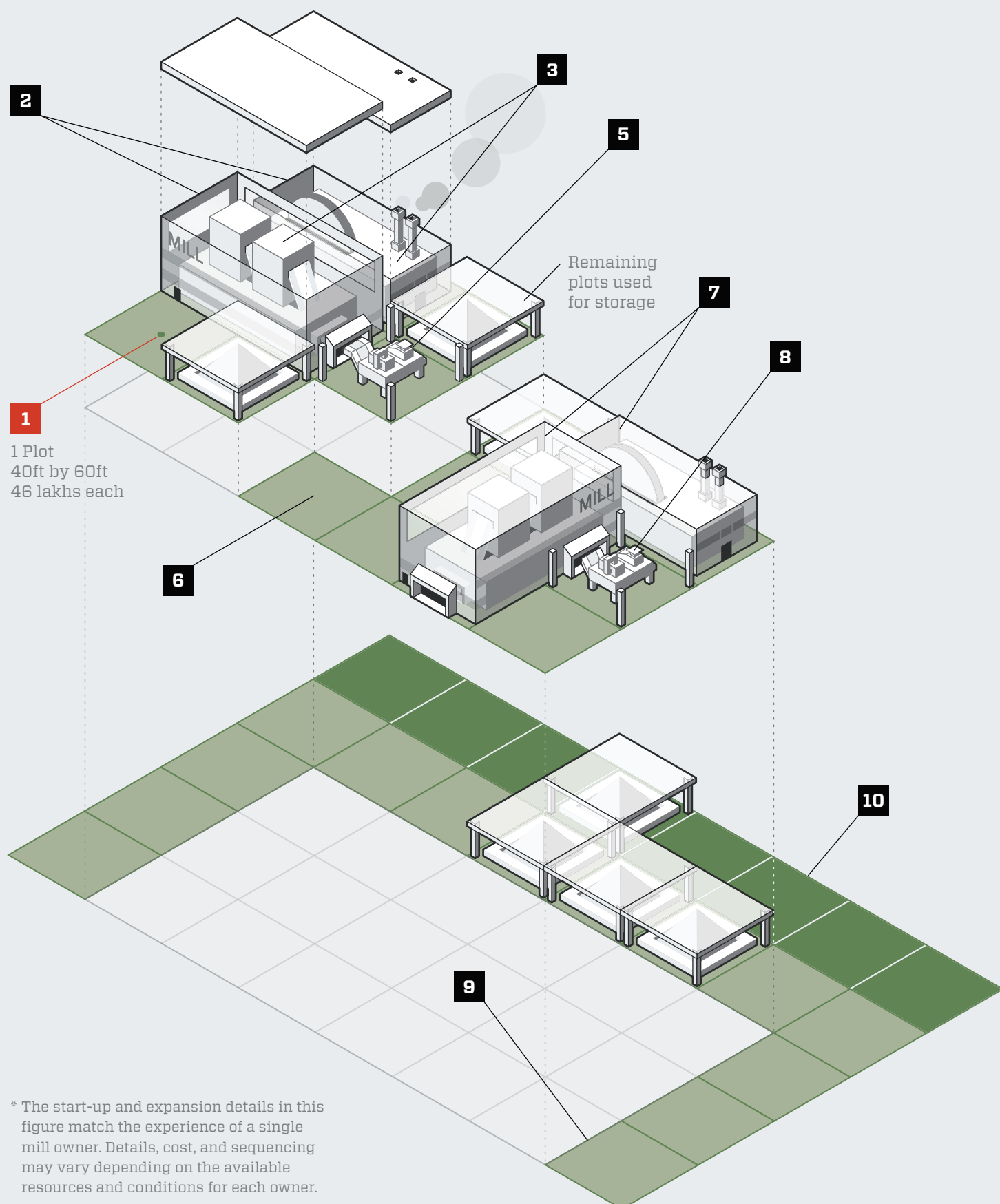
OPPORTUNITY AREA

Capital for Millers

A dearth in access to mid- to large-size, medium-term capital doesn't just impact farmers. The investment required both to start a mill and to make even minor upgrades is significant. The limited banking infrastructure and deficit of products geared to agribusiness force millers to rely on either savings or a combination of formal and informal loans for capital investment.

Figure 3.05

How to Build Out a Mill



* The start-up and expansion details in this figure match the experience of a single mill owner. Details, cost, and sequencing may vary depending on the available resources and conditions for each owner.

● Getting Started *

- 1 2005**
Buy eight plots.
46 lakhs/plot.
Total cost: 368 lakhs
- 2 2006**
Build the structure for the mill and gastifier (supplies power for the mill). 1,500 lakhs and 500 lakhs respectively. Two plots each.
- 3 2007**
Install start-up mill and gastifier. A gastifier consists of engines and generators operating together to produce power for the mill. 1,000 lakhs for the mill and 400 lakhs for the gastifier.
- 4 2008**
Start operation. Average start-up cost of 2,500 lakh

● Expanding & Upgrading

- 5 2010**
First, install an “upgrade set” to improve quality. Typically a color sorter and polisher. 1,500 lakhs for the set
- 6**
Then, buy ten more plots for machinery and storage space. Total cost: 460 lakhs
- 7 2011**
Install second mill. 1,000 lakhs
- 8 2012**
Install second “upgrade set”. 1,500 lakhs
- 9 2013**
Expand up to 14 more plots for production flow. Total cost: 644 lakhs
- 10 2015**
Expand by eight more plots for a total of 40 plots of land. 100 lakhs/plot, Total cost: 800 lakhs

Current

Forty plots of land total, up to 96,000 sq ft with two mills and two upgrade sets.



1
Above,
Milled rice being
bagged

2
Above Right,
A truck loaded with
bags of rice departs
for Mandalay

Productivity and Demand

Due to the high demand for high-quality rice, some mills have ramped up their operations to run 24 hours a day, seven days a week, requiring both machinery and labour.

Historically, the volume of production has been constrained by access to stable electricity. In the past, this was remedied through having electrical generators that burned the paddy husks, and today many mills run off of a hybrid of self-generated power and diesel generators. In addition, the electrical grid is becoming more reliable.

The mill is a significant employer in the rural economy and requires between 20 and 50 employees to run it full-time, depending on operating hours and production volume. Of the mills that we visited, a majority of employees were paid at least 5,000 kyats/

day—a solid wage for young men and women who might otherwise be earning a quarter of that working on farms.

While there is a steady stream of demand for domestic consumption, mills that specialise in producing rice for export are exposed to significantly more volatility. In Pyay, where a majority of the rice produced is exported to China, a temporary closing of the border at Muse can result in a week of downtime for the mill, which also impacts the employees' work hours. To minimise the impact of this volatility, mills constantly look for diversity in new markets.

"You get more money selling it straight to the export companies, of course. My mill is the only one in town paying good price for paddy."
[DNU-IND-GRP01]



Storage and Warehousing

The basic storage space for a small- to medium-sized mill is around 5,000 square feet, which is used to store paddy in queues of aging/stored paddy and overflow rice. In larger mills, it is common to have up to 50,000 square feet of storage to accommodate both the storage needs of the mill and its customers—which the mills typically offer for free to their customers. There is an obvious opportunity, through a tighter relationship between farmers and millers, for warehouse space in these convenient locations to be utilised by farmers to safely store their harvest for sale at when prices are more optimal.

In Danubyu, where farmers often liaise directly with millers, farmers are given a voucher to document the paddy being stored at a mill, which they can bring with them when it is ready to process and sell.



DOMESTIC TRADER

As the middlemen and women between millers and retailers, traders play a significant role in setting the market price of rice. They buy milled rice directly from mills or rice brokers and sell it to other traders, retailers, or customers who demand a high volume of rice, such as restaurants. Some traders are also involved in milling, wholesaling, and retailing rice. For example, for [PYI-IND-F01], rice is a family business. While she runs a wholesale trade operation initiated by her father, her daughter operates a small retail shop in Pyay.

They are intimately connected with rice millers around town, but don't deal with farmers directly. Even larger farmers do not trust traders and wholesalers for fear of being cheated, says [PYI-IND-F01].

While she runs a wholesale trade operation initiated by her father, her daughter operates a small retail shop in Pyay. They are intimately connected. Traders typically have access to storage capacity in warehouses to store rice they've bought at a low price to sell when the price is higher. Like [SHB-IND-M16], they can sort the rice bought from the market by colour and quality, and then sell it at a

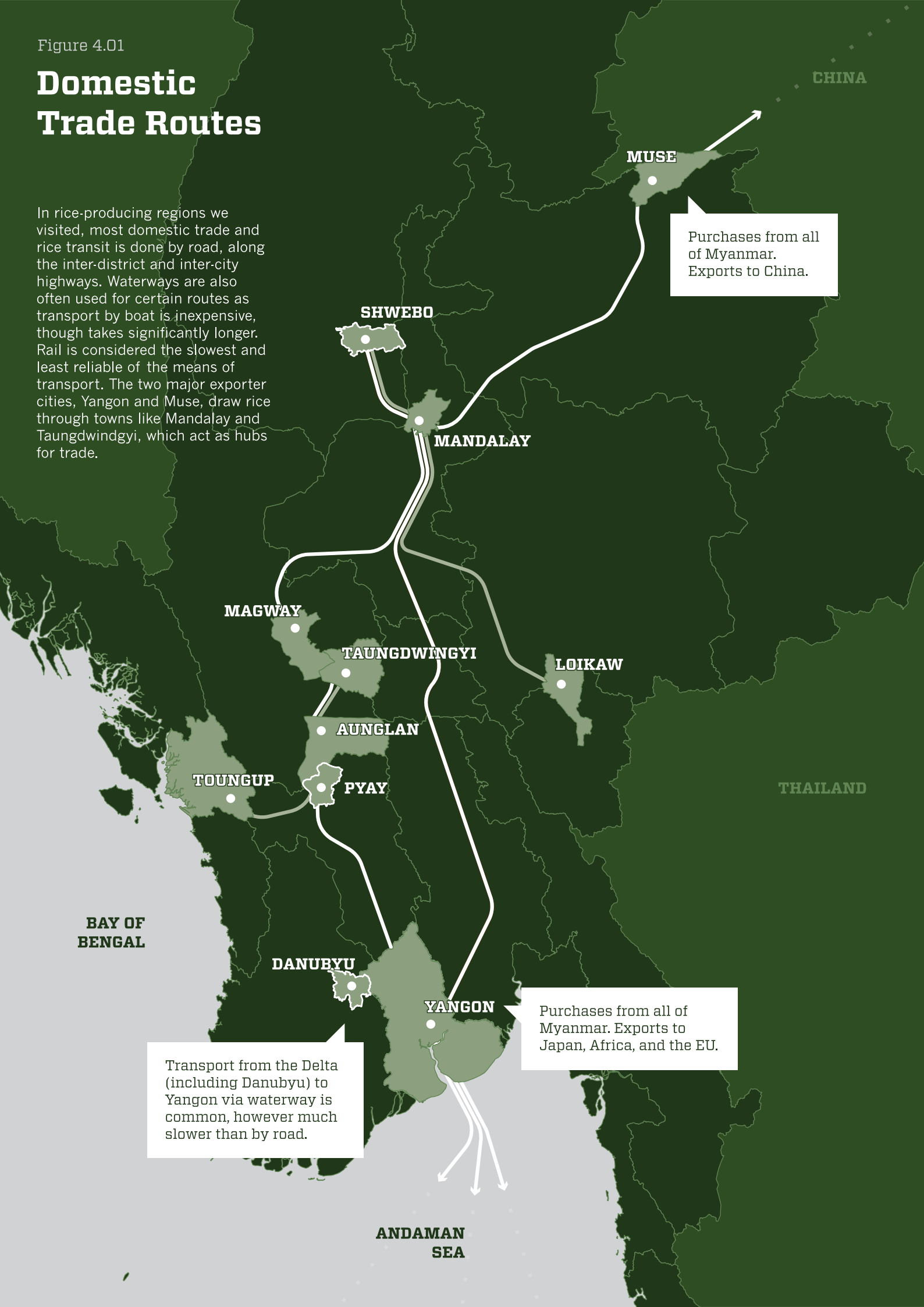
higher price. The trader assesses trends and volume of demand for different types of rice from orders received from retail customers to understand where the price is heading.

As someone with an acute sense of what the customer will pay a premium for, the trader plays a significant role in assessing quality assurance. The domestic rice trade is a buyer's market with supply outstripping demand. Within reason, traders will only purchase the level of quality they perceive a market demand for. Traders are price setters, while farmers and millers are largely price takers.

Figure 4.01

Domestic Trade Routes

In rice-producing regions we visited, most domestic trade and rice transit is done by road, along the inter-district and inter-city highways. Waterways are also often used for certain routes as transport by boat is inexpensive, though takes significantly longer. Rail is considered the slowest and least reliable of the means of transport. The two major exporter cities, Yangon and Muse, draw rice through towns like Mandalay and Taungdwindgyi, which act as hubs for trade.



“I prefer being a merchant over being a rice miller because I have more freedom. I can buy or sell whatever I want if I like the price or the quality.”

- Rice Merchant, Shwebo [SHB-IND-M07]

There are two forms of traders: domestic and exporters.

- 1 Domestic traders** purchase rice from rice-growing areas and sell it to other traders or retailers in non-rice-growing areas. Many domestic traders [such as PYI-IND-F01, Pyay Lady Wholesaler] sell to Muse, where it eventually gets used for export to China. Domestic traders are scattered around Myanmar, often basing themselves in the areas from which they purchase rice in order to secure competitive prices. They check market rice prices in Yangon and Mandalay almost daily. When a trader chooses to sell directly to townships, the rice bypasses the large trading centres in Yangon and Mandalay.
- 2 International exporters** are usually based in Yangon, from which they can access the main port and international buyers.

Why Trade?

[SHB-IND-M07] became a trader because of the freedom that owning a business affords him. As he explained, “I prefer being a merchant over being a rice miller because I have more freedom. I can buy or sell whatever I want if I like the price or the quality. I am limited with what I can sell when I have the rice mill.”

Trading is also an attractive profession for those who have the capital and mind-set to seize opportunities as they arise. In 2004, after [PYI-IND-F01]’s father observed rice trucks entering and leaving Pyay at a time

when there were only two or three traders in the local market, he decided that rice trading could be a viable business.

Some traders are driven by ancestral pride. [DNU-IND-M16], from [DNU], says his family has been trading for generations. This reflects Hinduism’s influence in Myanmar as families from the Varna Caste in Hindu culture traditionally specialize in trade and commerce. Similarly, those from Kone Theh Myo or trader families proudly continue their families’ traditions and legacy in the rice trade.





A Day in the Life of a Trader

Early Morning

6:00am –
9:00am

The trader has to visit the rice-trade exchange centre to inquire about the market price of the day and about the available stock. Depending on the location, the trade exchange centre may be formal or informal.

In Shwebo, the trade exchange centre is a tea shop in the morning, where all the rice millers, rice brokers, and rice traders have breakfast together and discuss market trends. Many millers and brokers bring their rice samples for the traders to assess for quality, which is mostly based on the percentage of mixed grains versus broken grains, and the grains' colour.

In Pyay and Yangon, the rice-trade exchange centre is a formal institution; to enter, one must be a member. Despite being a formal institution, the exchange centre has a family feel to it. The millers and the rice brokers bring not only milled rice samples, but also corresponding cooked rice. The quality assessment here is based not only on the quality of milling process but also on the fragrance and texture of cooked rice.

Late Morning

9:00am –
NOON

Once the trader has identified the rice he wants to buy, he arranges the transaction and transportation with the broker and the miller. He prepares a purchase voucher and arranges for the rice to be delivered.

"The invoice is a really important document. We need it when we have disputes over price or payment. I have a copy of the invoice and the seller has one". [SHB-IND-M16]

Early Afternoon

NOON –
2:00pm

The trader doesn't pay the full amount until he receives his goods. He also spends his afternoons compiling his list of payables, and then visiting with the brokers and millers from whom he's trying to collect.

Late Afternoon

2:00pm –
5:00pm

The trader inquires about the market prices from places with which he is trading and figures out where and to whom he wants to sell. Typically, his regular retailers or small traders contact him first to place an order.

Evening

5:00pm –
8:00pm

The trader arranges for shipment of orders made from other locations. Many domestic traders sell to traders from Muse because China is still the major buyer, while other domestic traders do not export directly to China via the China Trade Route because of the volatility of their market. Hence, the traders also try to acquire a domestic customer base within the country. Some of the locations where the traders sell are across the country from where they are located.

"Today at the Pyay Rice Exchange Centre, nobody could sell anything today because the China Trade Route is closed. But I sent a truck to Taung Gote Town in Rakhine State".

[Almost China Export]

"I sell mainly to Yangon, Taunggyi, Mawlamyine and Loikaw. Loikaw is my biggest network".

[Futurist Rice Mill]

Right,
Distributors and
traders have
stock that turns
over regularly

Challenges

A major challenge for traders is the difficulty of predicting profits. Volatile prices and informal markets ensure that the trader never knows which risks will pay off. “Being a merchant, you can never calculate your profit”, so says a mill owner [PYI-IND-M04].

Traders involved in the black market trade with China through Muse sometimes have to deliver their goods before receiving payment in full. In addition, traders must account for high transaction costs such as tolls and currency exchange.

Compared to millers and farmers, traders are more immune to the threat of natural disaster. When there is a drought, flood, or pest infestation, traders adapt their prices to reflect changes in market conditions.

Key to Success

A successful trader has vigorous quality and payment controls. After an initial agreement is made, the miller delivers the order to the trader’s warehouse, and each bag is inspected for quality and weighed separately. Any bags with compromised quality or weight are set aside for renegotiation. A trader never pays in full before receiving what he’s been promised.

Having accurate knowledge of prices and trends based on a reliable information networks, on which they rely to receive accurate price and logistical information in real time, is crucial for traders.

[SHB-IND-M16, Secret Yangon Trader from Shwebo Rice Market] says his key to success is remaining low-key (despite buying high volumes) because it helps him achieve a stronger bargaining position. He is from Yangon, but pretends to be from nearby Khin Oo, so that his sources think he is local and therefore don’t try to overcharge.

Traders in Myanmar do not compete against each other aggressively. We found that retailers and traders maintain established relationships, so traders are not worried that others will infringe upon their networks. As [SHB-IND-M07, Careful Trader] says, “All traders have their own customer base. Nobody competes directly with each other”.

Going forward, however, it is uncertain how many of the current traders will be working alone. Improved infrastructure and communication technology may render the small-scale trader profession obsolete within the coming decade, and we expect many traders to integrate milling into their business or scale up rather than exist solely as middlemen.





RETAIL IN MYANMAR

For Myanmar's domestically distributed rice, retail shops are the final stop before landing in the consumer's kitchen. Most rice is sold through conveniently located neighbourhood wet markets, although larger retailers and supermarkets are becoming more common in urban areas.

The variety and range of rice quality sold at each shop reflects both the preferences of the township/city and the price point and preferences of the shop's customer base. A single shop will typically carry at least three different varieties of quality/grade rice. In addition, for the shops to supply rice, their operations are highly dependent on the productivity of the paddy farms in the region and their performance the prior season.

Variation of Rice Shops across Regions

Retail shops are the first point of call for consumers wishing to hear about and try new rice varieties. Most shops carry local varieties of rice, not least because local consumers' palates are accustomed to it.

In Shwebo, many locals in town (not necessarily farmers themselves) can afford to eat the high-quality Shwebo Paw San due to its being produced in nearby villages; otherwise, they would have to purchase a less expensive variety, such as Manaw. Similarly, it is common for shops in Yangon to carry Paw San from Pyapon, a rice-growing township much nearer to the city. High transport costs and regionality are still significant factors in rice cost.

As an example of the different approaches to township retail, consider two different rice stalls in a wet market in Shwebo. One is small, with a limited selection of lower-quality rice, particularly rough rice varieties, sticky rice, and broken rice with two to three price options. The shop operates off of small margins of 100 to 200 kyats (ten percent)

made from selling one to two pyi of rice to each customer, most of whom can only afford to purchase rice on a daily basis. (One pyi is equivalent to eight condensed milk cans.)

The other shop, considered the best seller in the market, carries higher-quality rice grades, often selling in large quantities (including fifty-kilogram bags), which she delivers free of charge to her customers. She attributes her reputation and sales to the combination of her top-notch customer service and fair fixed prices (this is known by her customers, which means there is no bargaining in her shop).

Even in the same town and in the same wet market, these two retailers provide distinctive services for different customer bases: one sells in small quantities with a limited amount of varietal choices and the other with larger quantities and multiple varieties.

Many retail shops are family businesses run by two family members, often with an affiliated wholesale business either under the same name or run independently by an immediate family member. In conjunction, wholesalers and retail shops are able to manage their stock levels and maintain a volume of flow-through that benefit both businesses.

Village Distributors

It is common for a village to have individuals who resell through a small grocery in the village, and others who act strictly as couriers. This is more prevalent in difficult-to-reach villages where people have to rely on taxis and village salespeople as transport between the villages and the closest market is typically quite difficult. By having village distributors, the villagers can save themselves a trip to town to stock up on vegetables, rice, or other dry goods. These individual

distributors provide a useful service to those who might otherwise spend considerable time and money travelling to the nearest town. For distributors who deal in rice, it is quite common to have a relationship with a township rice shop, from which they purchase a few bags every couple of weeks for resale in much smaller quantities within the village.

Farmers as Consumers

In the past, it was quite common for paddy farmers to retain some of their harvest to keep for their own family's consumption. Fifteen baskets per person per year was a common volume to save. Today, however, many families need to sell at least part of their paddy immediately after harvest in order to pay off debt. Plus, farmers often grow varieties that either they do not prefer to eat or are too high-end for them to afford to eat. In Shwebo, for instance, we met farmers who sell their Shwebo Paw San paddy to mills, and buy rough rice for their family's consumption. Many cited a preference for rough rice because it is slower to digest, which can be cost effective for farmers who work long hours between meals.

From Wet Markets to Supermarkets

A typical housewife in Pyay starts the day by visiting the local wet market near her home, to purchase her daily groceries and anything else she needs. The market carries everything from needles and soap to meat and vegetables. Most vendors are open to negotiating the price of the goods. Although bargaining at the wet markets is one of the perks in the shopping experience, a housewife (and it is usually the female head of the household who makes the rice purchase) in

Yangon prefers an indoor supermarket where all the items she needs are nicely packaged and can be easily picked up anytime with a price tag.

Her grocery list might include the ingredients she needs for her specific choice of curry that day and, of course, rice. She can buy as much or as little rice as she needs. She takes a handful of Ayar Min, presses it in her hand to feel the quality, and smells the rice to make sure it's fresh. Since she comes to this shop every day, the seller will sometimes recommend a certain new variety, and perhaps give her a sample to test.

Three hundred miles from Pyay, a housewife in Yangon goes through a similar routine, but instead visits a supermarket for her errands. Similar to wet markets (where she used to shop as a girl), she can buy all the goods she needs from one place. However, rather than visiting different vendors, she sees different brands and volumes of packaged foods. She doesn't have to visit the supermarket as frequently, because she now has a refrigerator for perishable goods and buys rice from a retailer in 50 Kg bags and stores it at home. While she has more exposure to varieties of different regions at the supermarket or the regular rice retailer close by, she doesn't touch or otherwise handle the rice before purchasing. Her rice seller maintains a consistent quality of Shwebo Paw San and Phyar Pone Paw San, so she gives a call and has a bag delivered whenever her family is running low on rice.

Wholesalers

In contrast to retailers, wholesalers offer “big sales, thin margins”. Long-term relationships are built through providing retailers with consistent quality, efficient order fulfilment, and prompt payment.

To maintain a strong wholesaler-retailer relationship and lock in customers, they often provide credit to the retailers.

There are **three types of credit sales** offered by wholesalers:

1.

Buyers deposit half of what they've purchased and pay the rest later.

2.

Buyers pay a certain amount up front and then pay back the remainder once they've sold the rice.

3.



Scheduled payments are set by the wholesaler. The repayment schedule is typically around three months and is based on trust and mutual understanding.

Archetype

12



THE POPULAR RETAILER

Land Ownership	Income Diversification	Outlook/ World View	Biggest Challenge	Capital Need/Loan types
None 	<ul style="list-style-type: none">- Rice retail shop near the market- Occasional rice trading	8-10 years 	<ul style="list-style-type: none">- Proper storage space- Maintaining rice quality	<ul style="list-style-type: none">- Family's revolving investment is enough to run the shop.- Additional multi-year loans may be necessary when they expand into rice trading or wholesaling.

Ma Sandar, 35

Shwebo

Family:

Single, living with parents,
leading the family business

Education:

University degree

Situated in a prime location near the market, Ma Moe Moe Aye's rice retail shop attracts customers from all walks of life, from the well-to-dos to the hand-to-mouths. Seven years ago, she took over the 27 year-old family business her father started in 1988. The shop sells about 20 rice bags (50 Kg each) per day, totalling up to 9,000 bags per year. Her younger brother, who lives separately with his own family, runs a rice trading business in another part of town. She believes a retail job is more suitable for women than men because it takes patience and stamina to deal with all the customers bargaining for a lower price. Her brother prefers wholesale trading because he doesn't need to talk to as many people as she does.

Retailers are the face of the rice supply chain for ordinary consumers. When customers want to try a new variety or are not satisfied with the quality of rice, retailers are the first ones to hear about it. Ma Moe Moe Aye and her family closely observe consumer preferences within the domestic rice market. They believe consumers nowadays demand a higher-quality rice compared to the past. Keeping up with the trends, they buy their stock from multiple sources: mainly through local millers, Yangon wholesalers, and occasionally through local brokers. They rarely buy directly from farmers. They prefer to work with only the selected few with whom they have worked for decades because they trust them for quality and price.

Ma Moe Moe Aye's main challenge is to keep the rice inventory fresh year-round because rice goes stale after about five months of being processed. She therefore never keeps more than 1,000 rice bags in inventory. She usually stores between 30 and 50 bags in the shop, and the rest at the two storage facilities they own. Price fluctuations do not significantly affect her profitability because her inventory turnaround time is short enough for her to adjust the retail price accordingly. Most of her retail transactions are cash-only, except for the small retailers, who usually buy from her on credit.

She likes being a rice retailer and plans to continue the business because it is a steady business with low risk. She is confident she can keep her position in town as a best-selling retailer because of the shop's prime location and her family's good reputation in providing good-quality rice at a fair price.

"[I am] the best seller in the market because my prices are reasonable. I'd rather get lower margin from 20 people compared to higher margin off of ten people".

[SHB-IND-F02, owner of the best-selling retail shop in the market]

"It was my dad's decision to move to the city because he saw no margin in being a farmer, so I became a salesperson". [SHB-IND-F02]

Figure 6.01

Consumer Rice Preferences

Myanmar people are sophisticated rice consumers who use sight, smell, touch, and taste to assess what is optimal for their needs. At the point of purchase, consumers consider the following:

SIGHT

QUALITY

The quality of rice is based on milling techniques. Higher quality rice is more polished, looks whiter, and feels smoother to the touch. Lower quality rice grains can include spots or streaks and feel rougher to the touch. Rougher rice is more popular among poorer consumers because it can stave off hunger longer. Higher quality rice also has fewer broken grains and mixed varieties. The quality of rice is also an indicator of social status as the higher quality rice grains are more expensive. Pyapon farmers prefer export / Yangon quality Shwebo Pawsan and use it to show off their wealth.

SHAPE & OTHER ATTRIBUTES

Other characteristics of rice include appearance, such as how round, elongated, or white the grain is before it's cooked. Some consumers also make judgments according to how much the rice expands or how curvy the grain gets after cooking, and how long it takes to cook. Some consumers prefer the more polished, whiter rice grains despite knowing they have less nutritional value compared to less polished grains.

SMELL & TASTE

TEXTURE

Each rice variety has its own texture and hardness, even among the popular, high-quality Pawsan varieties. While Shwebo Pawsan is perceived to be a top-quality rice, some Shwebo farmers prefer Pyapon Pawsan because soft rice is equated with being soft.

FRAGRANCE

Every variety of rice has its own fragrance, which is associated with its overall quality more than even taste. The first Shwebo Pawsan grower started because he wanted to offer a fragrant rice to Buddha and the local monastery.

TASTE

Taste is heavily dependent on the percentage of starch in the rice. This is largely a personal preference.

OTHER CONSIDERATIONS

AGE OF PADDY BEFORE MILLING

A causal indicator to measure the moisture level of rice is its age. is its age.

Rice that has been milled directly after harvest tends to have more moisture because the paddy may not have had enough time to dry out properly. In these instances, there is a higher chance of the rice becoming slimy. However, if the paddy is stocked for years before milling, there is a chance the paddy will be too dry and become brittle. The perfect age of paddy is six months to two years.

PRICE

The price of rice is based on the market. Most rural consumers cannot afford to buy rice in bulk, so they usually buy in pyi (eight cans of condensed milk, or about 1.42 kilograms). Normally, a five-member rural household will consume one pyi of rice per day.

MOST IMPORTANT CHARACTERISTICS

The relative importance of each of these factors is based on personal preference, geographic location, and the socio-economic status of the consumer. Rural consumers generally put more emphasis on price and compromise quality, while the urban population with more income makes choices based more on fragrance and texture than price.

These preferences are reflected in a survey completed by 270 of Proximity Designs’ staff from across the country (including Yangon and 180townships). Respondents were asked to name the rice their family was currently eating, along with their preferred rice, and to rank each of these characteristics in order of importance in their rice purchasing decision.

The survey results can be found to the right and on the following page.

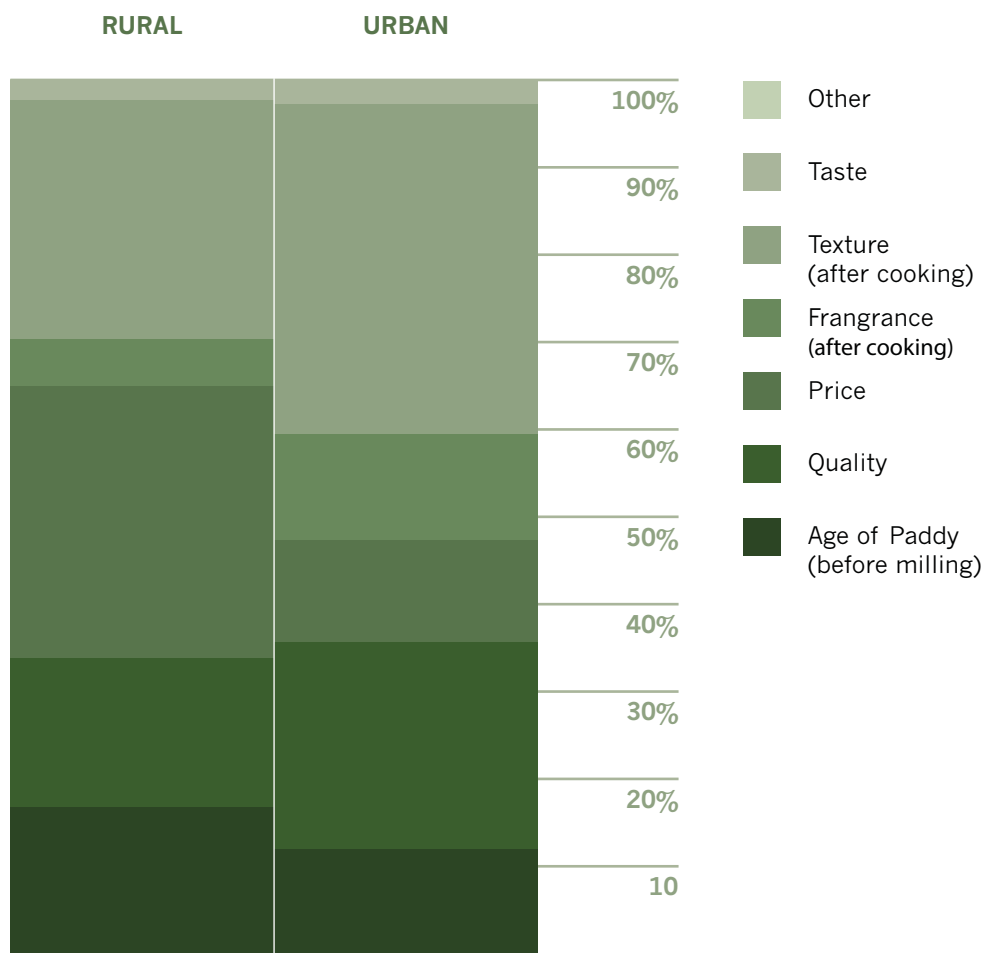


Figure 6.01 Continued, Consumer Rice Preferences

I'D RATHER BE EATING...

At the time of this survey, the majority of Proximity's staff was eating and preferred Paw San. Current consumers of lower-quality, cheaper, and less-fragrant rice such as Shwe Wa Tun and Manaw Thukat prefer higher-end rice.

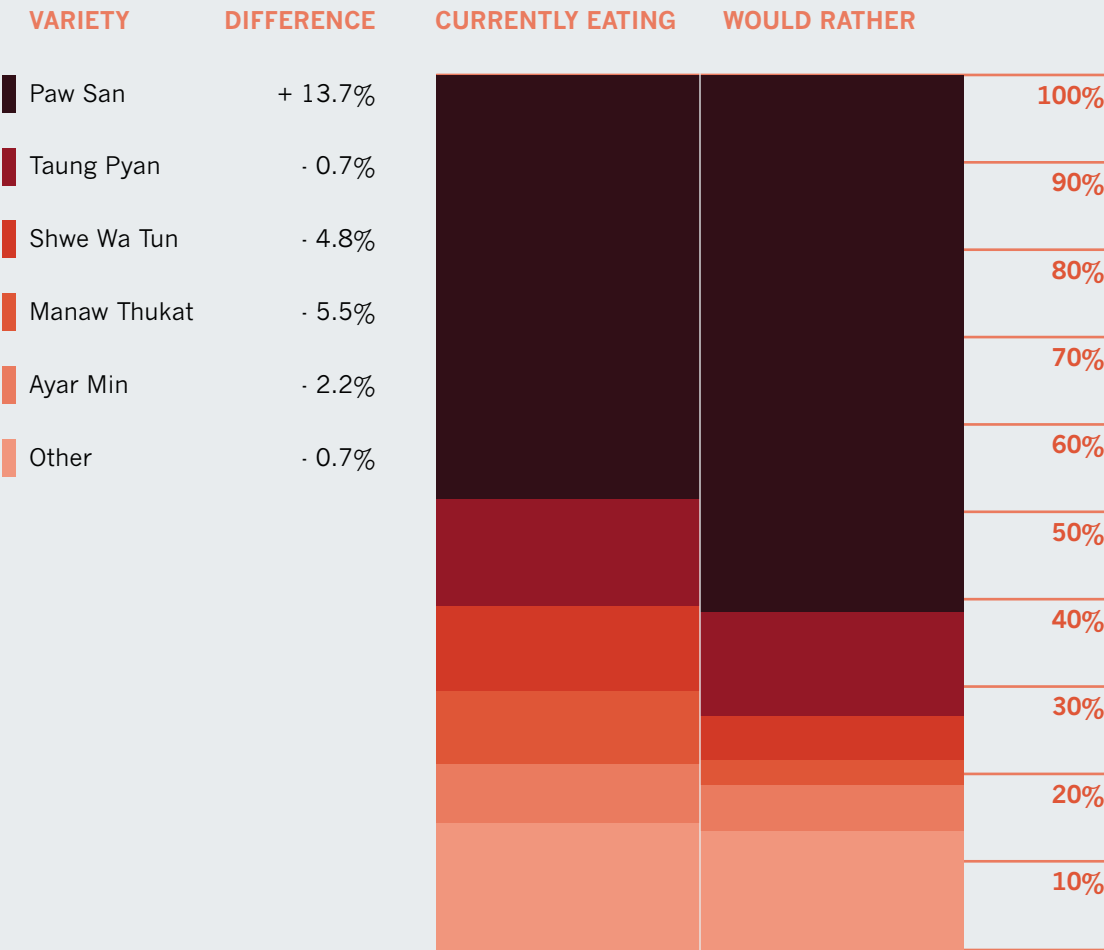




Figure 6.02

Rice Price Fluctuation

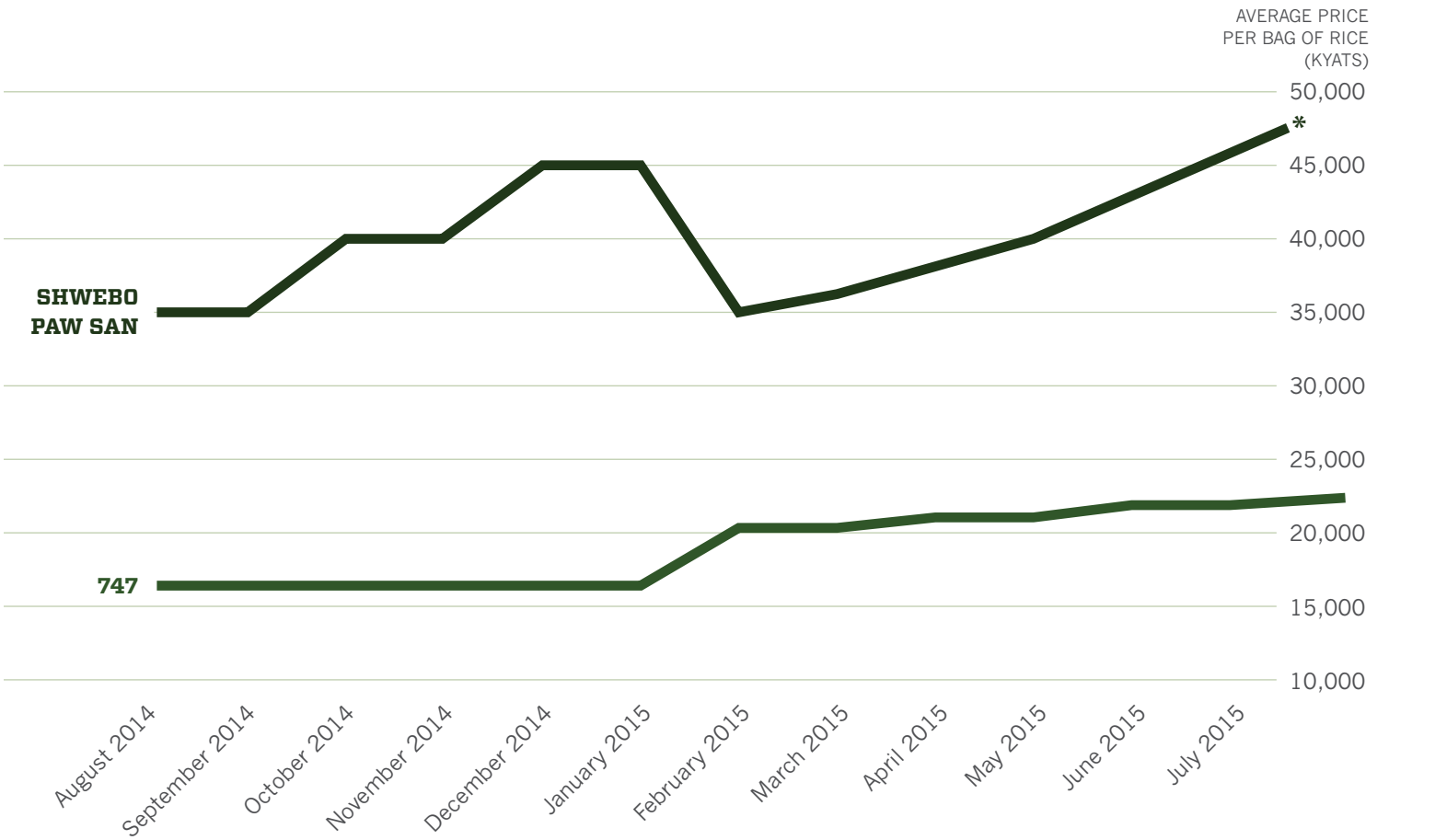
Below are the market prices for bags of two varieties of rice grown in Shwebo. Farmers are rarely in a position to take advantage of peak market prices because of their need to repay loans immediately after harvest, when the price happens to be at its lowest.

SHWEBO PAW SAN

Produces a high-end rice primarily distributed domestically. As this lucrative variety can only be grown once per year by farmers in Shwebo, farmers would need to hold the grain for 11 months to receive peak prices. Grown during monsoon, and harvested in February.

747

A low-quality rice grown exclusively for export to China. Though the market price is more consistent, conflicts or other disturbances along the border at Muse (a frequent occurrence) can cause mills to stop buying the rice, instantly dissolving the market for farmers. Grown during summer, and harvested in July.



* Due to heavy flooding in early August 2015 destroying thousands of acres of paddy, prices rose up to 80,000/bag in some parts of Myanmar.



Above,
Yangon rice retail shop,
selling rice by the pyi
(8-cup unit)



EXPORTERS

At the very end of the rice ecosystem, operating in Yangon far from the paddy fields in the Dry Zone, the delta, and the terraces of Shan state, are the exporters—the final stop before Myanmar rice is sold to international markets. In the past, Myanmar was the world’s largest exporter of rice. But after decades of decline, rice exporters are now picking up the pieces, with support from new government policies aimed at reinvigorating the historic rice trade.

Prior to the release of EU sanctions in 2013, Myanmar’s biggest export markets for rice were Africa, Bangladesh, and the Philippines. Today, Europe, China, and West Africa are the largest export destinations by metric tonnes of rice. Trade volume to China in particular has increased because of the booming border trade to Yunnan Province via Muse.



Above,
Rice broker negotiates
with exporter, showing
samples from his
preferred miller or
wholesaler

Who are Exporters?

In the past, only a handful of well-connected individuals were granted export licenses for rice. Today, times have changed and export policies have liberalised significantly. In 2010, the government opened the barriers slightly and allowed anyone to apply for an export license (they still needed to meet criteria to be able to export, so there wasn't a flood of applications).

Exporters purchase rice directly from domestic traders or millers. Some larger exporters also run their own mills, or at least colour-sorting and polishing facilities. Large exporters who are primarily focused on overseas trade are based in Yangon, while exporters engaged solely in the cross-border trade with China are closer to that region.

Exporters have a macro view of the rice economy in that they calculate volume in hundreds or thousands of tonnes and have a perspective on national rice policy. Exporters we spoke to articulated the need for policy strategies that support rice exports, such as constructive engagement with China on legalising the cross-border rice trade as well as increased credit, technology, and infrastructure.

Exporters are connected to traders and millers but do not deal directly with farmers. U Myo Thura Aye, a prominent rice exporter and former joint secretary of the Myanmar Rice Federation, claims he would not consider dealing directly with farmers due to infrastructure challenges. In the absence of village transportation services that are available in neighbouring Thailand and Vietnam, the challenges of getting rice from farmers to exporters directly inhibits such direct cooperation.

Procedures to Export

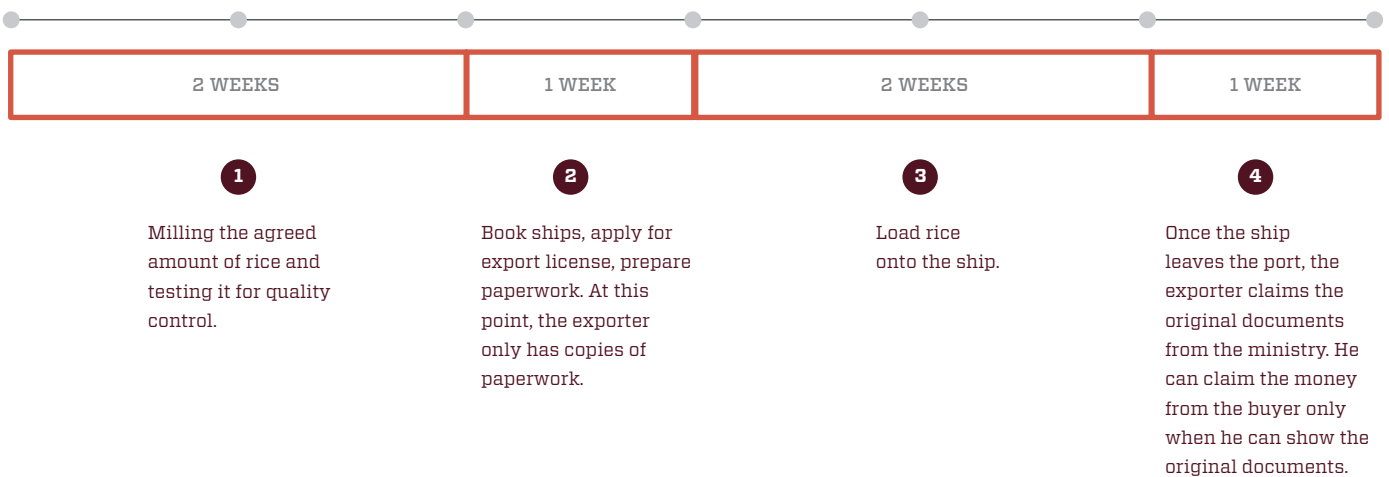
Exporting rice can be a lengthy process, largely dictated by the high quality standards of the importer. We interviewed U Lu Maw from Shwe War Yaung, a rice trading and exporting company based in Yangon, who gave an overview of the export process and some of its challenges.

Rice exports start with a negotiation between the buyer and exporter on price, quality, and shipment terms and conditions. Once agreed, the two parties sign a contract, after which the export process still takes at least six weeks.

The time taken depends on the amount of rice ordered. The higher the metric tonnage, the longer it takes.



EXPORT PROCEDURE TIMELINE



As U Lu Maw explains, “I have to worry about the ship before the original documents come in. But after I receive the documents, I’m not worried anymore. After the ship leaves the port, it takes about 30 to 40 days to arrive at the destination”.

In total, it takes an exporter approximately six weeks to finish all administrative procedures, and another month before the rice arrives at its destination. In contrast, traders working the grey market China border trade can move similar or higher volumes within just three to four days.



Above,
Wardan Jetty
warehouse, Yangon

What Does It Mean to Have Export “Quality”?

Export-quality rice is usually determined by the percentage of broken rice. Most of Myanmar’s rice exports are of 25 percent, meaning the rice contains 25 percent broken pieces. Other common types are ten percent and five percent, with the lower numbers indicating higher quality. However, while rice quality may dictate pricing, there are many challenges in Myanmar that help determine that quality.

In order to provide third-party quality testing required by buyers, particularly in the EU, exporters have to send samples to Bangkok because Myanmar does not currently have the ability to provide this testing.

According to U Myo Thura Aye, there has been no difference in paddy quality in the last 20

years. There has only been a slight expansion of technologies in milling. This is a result of inadequate investment in agriculture in Myanmar over the past two decades, which has left the national rice industry incapable of producing enough high-quality rice for export.

Meeting quality requirements for exports, especially to the EU and US, requires a significant increase in investment in technology and knowledge over the coming years. There is room for improvement at every level of the rice ecosystem to improve the quality of rice to meet export standards, from investment in farming techniques, new seed technology, and markets and transportation to testing infrastructure.

International Markets

At its pinnacle, Myanmar was the world's largest exporter of rice. Historically, the 1940s and 50s were a golden age for Myanmar's countryside gilded with monsoon paddy harvests. It's no surprise that much of the country's economic focus and national identity are based on rice.

Today, Myanmar is rebuilding its rice industry, currently estimated to be producing ten million tonnes or more annually—and growing rapidly. Nestled along the Bay of Bengal and Andaman Sea between India and Bangladesh to the west, bordering Thailand and Laos to the east, and with a network of inland rivers that provide transport up towards the northern borders near China's Yunnan Province, the country is optimally located for export into neighbouring markets.

Currently, up to 30 percent of Myanmar's rice production is exported. Farmers have been promised that if they continue to grow paddy, as their ancestors have, they will be given good prices for their crops. Therefore, all the government ministries pay heavy attention to the rice industry, understanding that finding markets for the crop means improved livelihoods for the people as well as represents a political mandate for leaders.

The biggest export destination countries for Myanmar rice vary from year to year as policies and exchange rates fluctuate. During the initial years of export policy reform, all players along the rice supply chain in Myanmar struggled to keep up with complex government and port bureaucracies and inconsistent policies, not least of which was

the exporters. Export volumes fluctuate because of constantly changing policies and market conditions in both Myanmar and foreign importing countries.

Export bans have periodically been imposed when domestic rice prices rise, causing foreign buyers to be wary of business relationships with Myanmar exporters. Foreign buyers are additionally hesitant because of the inconsistent quality and supply of Myanmar rice. Export rice qualities are inconsistent because of shortcomings in processing technology and testing infrastructure. Rice is sourced from multiple traders and milled to fulfill each shipment, so it gets mixed, lowering its overall quality. Some foreign buyers complain that because of mixed seed, Myanmar rice does not cook evenly.

While individual country requirements may differ, a blend of consumer preferences, policy, and logistics make some regions particularly favourable for Myanmar rice exports. Here, Ye Min Aung, managing director of MAPCO, oversees the major Myanmar public-private rice industry developments and U Lu Maw of Shwe War Yaung, one of the biggest exporters of Myanmar rice also shared their insights and outlook for these markets.

Global Export Destinations

FREQUENTLY TRAVELED

Certain destinations are regular recipients of Myanmar export rice, as their import quality standards are less rigid and /or demand a lower quality rice that Myanmar's old infrastructure is capable of producing consistently. However, with this flexibility in quality comes a compromise in brand; Myanmar rice is often relabeled at its destination as rice from a different origin.

LESS-PREDICTABLE DESTINATIONS

Due to inconsistent distribution channels, transient trade agreements and an inability to control export quality, export to Japan and European nations has wavered — despite a historical relationship between Myanmar and Japan.





RUSSIA

EU

CHINA

JAPAN

INDIA

**WEST
AFRICA**

**IVORY
COAST**

SRI LANKA

SINGAPORE

PHILLIPINES

Myanmar's Primary Rice Export Destinations

China

While official reporting for exports range from 500 thousand to 600 thousand tonnes annually, one thing is clear: The largest player in Myanmar's export market is China, and all of that trade is completely unofficial.

Even the most conservative government officials put the China border trade volume at over one million tonnes, with actual traders estimating a range of upwards of 1.5M to 2M tonnes, almost 20 percent of total production. Most of this volume is moving via grey market trade through Muse in Myanmar into Reili at the Chinese border. At the lower range of estimates, China still accounts for 60 to 80 percent of annual export volume, and has a significant effect on Myanmar's farmers.

European Union

Europe is a major destination for export because of its policy of giving preferential tariffs to exports from Least Developed Countries (LCD). This can drastically bring down the price of Myanmar rice and make it exceptionally competitive internationally.

The EU has stricter limitations on the rice it imports (e.g., no more than five percent broken grains). There are a lot of quality control tests as well. The EU particularly does not want Ufra Toxin or GMO grains.

Europe has had a Generalised System of Preferences (GSP) agreement with Myanmar, for two years. EU has GSP agreements with only two countries, Myanmar and Cambodia, because they are considered developing countries.

"I think the EU will still provide GSP for the next three to four years. It will be hard when they stop, but as a trader, I will just have to find a new and better market then". [U Lu Maw, Shwe War Yaung]

"Next year can be very important. We're working with the EU safety net exchange. If [we] export to them, then the rice is for the very poor, and [they] distribute rice to the urban poor. The EU and Sri Lanka work together to give the same technical assistance. This is affordable rice [for] the vulnerable and the poor". [U Ye Min Aung, Managing Director of Myanmar Agribusiness Public Corporation Limited (MAPCO)]

Japan

There exists a strong legacy of exporting rice to Japan. Mitsui Corporation imported 50 percent of Myanmar's rice exports to Japan in the 1940s and 50s. They are currently partnering with MAPCO in developing a major rice mill complex in Naypyitaw. Today, Japan runs a quota system that helps developing nations and supports other countries by donating rice.

"We promote Myanmar rice for future consumption in Japan. We cannot do Japonica (variety rice), because Japan will only take Japonica from Japan. But Intica is a long-grain rice used in sake and miso, rice powder, and snacks. Japan is a most difficult market; they have two hundred twelve tests for pesticide residue, so farmers can't use pesticides. For us, this is a blessing in disguise and we can penetrate the market, because we don't use [many] pesticides as our farmers cannot afford to". [U Ye Min Aung]

West Africa and Ivory Coast

While Myanmar rice quality continues to improve, Africa remains one of the major destinations for 25 percent broken rice, particularly West Africa and the Ivory Coast. We heard anecdotally that the ecologies of many African nations are less suited for planting paddy due to more arid weather conditions. However, although African consumers have lower incomes and consume cheaper rice, quality still plays a role in perception. Based on interviews with rice traders in Somaliland, Myanmar rice gets put into bags labelled "Made in Bangladesh" and resold for higher market prices.

Grey Market **CHINA BORDER TRADE**







China Rice Trader

Profile

“I don’t like the instability of trading through China unofficially. If you lose, you lose a lot; if you gain, you gain a lot. There's no institutional protection.”

Occupation:

Rice Trader

Business:

- Owns retail and wholesale shop in Pyay
- Conducts heavy rice trading and buying activity throughout the region
- Trades primarily through Muse

Affiliations:

- Bago Division Rice Association, *executive committee member*
- Pyay Township Rice Association, *executive committee member*
- Central Rice Association, *member*
- Myanmar Rice Federation, *member*

Reopening Myanmar rice exports

While informal trade through Muse into China has existed for centuries, there has been a significant expansion recently.

According to [PYI-IND-MO3], the chain of events is now nothing short of legend. Since Nargis, the government has initiated export strategy reforms. Despite a dramatic upswing in exports in 2011, foreign buyers began rejecting Myanmar rice product en masse, citing mixed seed and other quality issues. At one point, only 30 percent of Myanmar rice exports was passing inspection; everything else was getting turned away.

‘Everything was going well for one year. Then there was a fluctuation in the exchange rate and local market. There was an administrative change, tax policy changes, crazy changes in policy. In 2013, only a few countries would take our rice: Bangladesh, Japan, Africa, Nigeria, South Africa’. – PYI-IND-MO3 (may turn into SME)

By 2013, the situation had become dire. At conferences to address the issue, farmers were accused of



inadequate farming practices, leading to mixed seed quality. Mills were blamed for not investing in better equipment and intentionally mixing seed, substituting high-priced, pure rice with lower-quality, mixed seeds. Rumoured to be cutting corners and taking shortcuts in quality control, the rice companies, for their part, felt squeezed by a slew of new government policies and tariffs and unfavourable exchange-rate fluctuations. During the initial forays into foreign markets, a series of changes in ministry leadership led to heavy taxation and bureaucracy around the budding new rice export industry.

Stop #105: The Mandalay solution

Depending on who tells the story, the Mandalay traders are perceived by other Myanmar traders as either national heroes or profiteering scallywags. According to PYI-IND-M03, the Mandalay traders opened up a viable solution when the nation was hurting from an inability to export all of its rice production. Other traders like

“We don’t want to be #1 in rice exports. We need the domestic-to-international balance to be about 50/50.”

– YE MIN AUNG, MAPCO, MANAGING DIRECTOR

PYI-IND-MO4—who arrived late to the game—spoke derisively of Mandalay, saying they had been selfishly keeping the Muse-China gateway a secret in order to profit from the growing demand themselves, and that only through rumours and trial did other provinces gain access to this precious route.

‘The traders in Mandalay...they talked about how all this lower-quality rice could be sent through the China border trade. These traders had been smuggling rice to China. The traders in Mandalay suggested this to the association division level as a potential solution, but it was totally illegal. So Mandalay started experimenting with the border trade’. – PYI-IND-MO3

Either way, Mandalay played a major role in creating today’s China border trade, a term now synonymous with the rice market that expanded exponentially, practically overnight. While the national government continued to search for ways to address the slew of unhappy rice players, Mandalay traders were already solving the problem themselves.

The trade relationships between Muse and the Chinese border town of Riuli had survived decades of political regime changes in Myanmar. By 2013, Mandalay businesses had been steadily up-ticking the volume of rice getting trucked into Muse to meet Yunnan demand, about 1.4-2.4 tonnes daily. Although they were technically smuggling rice into China to be turned into snacks and noodles, doing so was a completely legal activity within Myanmar. Conversely, though unsanctioned imports of rice were considered illegal in China, officials turned a blind eye as Yunnan’s rice production fell. Their paddies got converted into more profitable crops, and Myanmar rice provided an affordable alternative to the province that was now a net importer of rice but geographically far from other rice-producing regions in China.



Mandalay State began a quiet coordination of local activities and infrastructure investment to experiment with supporting the China trade. The national government soon became aware of rice traveling via this route but could not officially support efforts at the national level due to China's import restrictions. However, the national government, too, profited from the increase in trade flow. Today, all rice exporting to China goes through Muse through ground transport, and every driver drives through Stop #105, where the national government collects tax on every rice-laden, Muse-bound truck.

An export strategy for a grey market

With the majority of export rice headed to Muse, an enterprising rice trader needs a solid China strategy. However, where does one start? Due to the lack of legal recognition on China's side, there are no formal export procedures or institutional support.



Unlike other grey markets, the Myanmar-China rice trade can be more accurately characterised as a white-and-black market. It is completely legal for Myanmar traders to export rice to China, but it is illegal for Chinese traders to import rice from Myanmar. China has been notoriously reluctant to officially recognise the Muse rice trade. At times, government officials close down the border and even arrest and jail traders, despite numerous Chinese companies setting up trading headquarters on both sides of the borders and Ruili banks accepting Myanmar national identification cards to open up Chinese bank accounts for Myanmar traders, in order to make it easier for them to conduct their rice business in yuan.

The sudden burst in rice volume at Ruili had been spearheaded by Mandalay traders in the know, but the rest of Myanmar joined in through trial and error. With sparse information, poor infrastructure, and a strong dependency on trustworthy relationships, traders face a challenging landscape to navigate, but one that is potentially highly lucrative.

Myanmar government ministries and the Myanmar Rice Federation (MRF) have devoted much effort to officially managing and legalising the rice trade with China through the AQSIQ trade agreement, a memorandum of understanding between ASEAN countries and China's Administration of Quality Supervision, Inspection and Quarantine. The first steps of exporting 3,000 tonnes with vigorous quality-checking could potentially lead to the introduction of a quota-system trade agreement. With known volumes and explicit quality benchmarks, officials can more readily introduce better production standards and coordinate Myanmar industry planning.

However, as of reporting, China has not yet signed the final agreement. Insiders cite the Chinese government's sensitivity to local farmers who complain about cheap Myanmar rice flowing through Ruili, even as large swaths of the Yunnan Province are converting to more profitable crops, thus constraining domestic local rice supply. Meanwhile, as official government-to-government efforts continue, Muse trade moves upwards of 10,000 tonnes daily into China. The transporters carry truckloads of Sin Thwe Let, 747, and other popular Chinese-preferred rice varieties that now dominate the fields of Ayeyarwady.

"We don't want to be #1 in rice exports. We need the domestic-to-international balance to be about 50/50. Officially right now, about ten to 15 percent of production is being exported. Unofficially, it's closer to a 75/25 or 80/20 domestic-to-international because of China. But through the China border trade, many farmers are able to improve their incomes and livelihoods". - Ye Min Aung, MAPCO, managing director



Challenges for the Exporter

A major challenge for rice exporters in the current market, according to [PYI-IND-M03], is surplus supply in local regions and maintaining a large inventory. With stricter controls along the China border as Chinese officials have cracked down on illegal rice imports from Myanmar, exporters are having difficulty finding new markets. Because [PYI-IND-M03] is a domestic trader in addition to being an exporter, he also relies on his domestic network of retailers for the everyday survival of his business.

Exporters brave great risks by engaging in grey or black market trade, because by definition, they are not protected by the Myanmar government if they get caught. They risk being arrested by the Chinese government if caught trading Myanmar rice in China, and also risk being exploited and cheated by Chinese merchants who hold the upper hand in deals because they know that Myanmar exporters using the Muse-Reili route have little other choice. Anecdotally, we also learned that exporters who send rice by boat to Bangladesh run the risk of their boats being sunk at sea if they do not pay bribes.

Exporters face fierce competition from each other and rice exporters from other Southeast Asian countries, both in terms of price and quality. Neighbouring countries such as Thailand and Vietnam are further ahead in terms of mechanisation, investment, and infrastructure and can offer good-quality rice at extremely competitive prices. Meanwhile, exporters in Myanmar are still struggling to

meet the quality standards demanded by Western markets. As [PYI-IND-M03] points out, he has to deal with mixed rice at two different levels: unintentional mixing by the farmers who lack the knowledge and technology to avoid cross-pollination and intentional mixing by millers. High port charges and export procedures costs also lessen the competitiveness of Myanmar rice in the global market. (World Bank 2014)

Another major challenge for exporters is the politicisation of rice itself. In the run-up to elections in the past, export restrictions have been known to tighten in order to lower domestic prices for rice, which hurts farmers and exporters but appeases the voting urban masses. There was also the concern among exporters, according to U Myo Thura Aye, that if the 2015 elections did not go smoothly, exports to the EU would have been suspended.

Going forward, exporters are pressing for increased investment and infrastructure supports for national rice exports as well as stable strategic export policies. Increased investment in equipment and knowledge will produce the yields and quality needed to be competitive in global rice markets beyond the term of preferential tariffs. Stable, predictable, and supportive policies will not only streamline the supply chain and make it easier for exporters to navigate the export bureaucracy, but also encourage foreign buyers to build long-lasting relationships with Myanmar exporters.



Above,
A dry goods seller in
Hargeisa, Somaliland

Beyond the Asian Market

Though much of Myanmar's export rice is destined for Asian countries, some of it travels further afield.

Last year, Studio D ran a research project in Somaliland, an autonomous nation-state to the north of Somalia across from the Arabian Peninsula. Our team took the opportunity to investigate whether Myanmar rice had travelled to this unique corner of the world. Rice, known locally as bariis, is a lunch time staple that is often flavoured with cardamon, clover, cinnamon, or cilantro before being served with chicken or other meats.

Interviews with local rice traders revealed that, although Myanmar rice was not

commonly available, sacks of 65 percent whole grain Myanmar rice had recently been imported. However, with Myanmar being an unknown quantity, and there being a local affinity for another predominantly Muslim, rice-producing country, it was relabelled as Pakistani rice so it could command a slightly higher price. Most local consumers would not realise that the white grains lining their preferred dish may have started out, much like our own journey in the paddy fields of the Irrawaddy delta.

The aspiration for Myanmar is once again to be known as a major rice producer for the world, and over time, to become associated with producing premium rice. The opportunity lies at each stage of the supply chain, from paddy to plate.



OPPORTUNITY AREAS

Throughout this report, we have included specific call-outs to indicate areas we believe to be ripe for product, service, or policy innovation. They are informed both by our field work described herein, deep expertise in the Myanmar market, and by the team's decades of experience in the design and product-development space. This section is a collection of all Opportunity Areas.

Weather Prediction & Awareness

An overabundance or lack of rain and, high winds, and prevalence of sun all have significant impact on crops across growing seasons. Without the ability to predict and respond, farmers are unable to protect their crops from adverse weather conditions or take advantage of better weather conditions.

Localised weather predictions, paired with suggestions, can provide farmers with control over the growth, health, and outcome/yield of their crops. Establishing practices and tools for accurate weather prediction and response has the potential to scale with the market to more sophisticated product and service solutions, including the use of sensing technology and automated farm systems.

Preparedness for/Adaptation to Climate Change Events

The dire effects of climate change have already been felt by farmers in Myanmar and other countries in the region. While climate change-related events and conditions are not expected to wane, an increasing awareness of the conditions and ability to predict changes present an opportunity to translate into shifting of farming practices to a more predictable and sustainable agricultural future.

Investing in infrastructure advancements and experimentation with new and re-appropriated farming technologies may be proactive measures that stem the tide of climate-related farming disasters.

Land-Levelling/Management

Current methods utilised for land-levelling are either wholly home-grown or part of a larger land modernisation effort. Accessible and practical means

of land-levelling for the majority of farmers have not yet been meaningfully addressed. Land-levelling has many positive impacts on farmers' land (such as more equal watering, fertiliser distribution, more even growth of plants, and easy use of machinery), whether applied by the farmer or a third party. Both initial land-levelling and its maintenance are opportunities for new products and services, as farmers may choose to either manage them themselves or subscribe to a maintenance program. Additionally, auxiliary services, products, and processes (such as canal-/irrigation-trough maintenance and direct seeding) can begin to be offered after land-levelling is achieved.

Availability of Affordable, Quality Seed

The shortage of quality seed (both from public and private institutions) and a dearth of knowledge at the basic farmer's level regarding the importance of seed quality are contributing to an inconsistency in farming practices and output of quality, accountable product from Myanmar's paddy farmers. Current seed produced by private companies is both limited and significantly higher in cost, rendering it unattractive to farmers who may not have access to the more affordable government-reproduced seed (save for instances, such as with Gold Delta in Danubyu, where purchasing seed comes with a guaranteed market price come harvest time). The delta between professional, accountable, and quality-controlled seed reproduction and distribution and traditional means of recirculating seed amongst villagers and within an individual farmer's own farm has yet to be taken advantage of.

Soil Health/Fertilisation

There is currently a mismatch between fertilising needs and what the farmers are applying to their fields. Accurate and accessible soil assessments paired with a fertilisation regimen and other practices has the

potential to address specific deficiencies as part of the fertilisation regime. This would be combined with a programme to increase farmer literacy on soil health and maintenance.

Crop Insurance

With an increased prevalence of pests and disease and the unpredictability of weather, farmers have become less confident in their ability to assess whether the quality of inputs is having an impact on their yield. The risks associated with even a partial loss in crop can be catastrophic, causing farmers to go deeper into debt and forcing them to sell off assets and land.

Although there have been challenges in effectively implementing crop insurance in other markets — due to the acute awareness needed to mitigate risk for the insurer and the presence of a strong value proposition for the farmer — there is potential for a properly structured insurance product to maintain financial stability for farmers in unpredictable times. Crop insurance is most effective in combination with other solutions, like access to seeds/markets and actionable weather information.

Ecology Education for Farmers

There is a significant disconnect between information available as the result of scientific advancements and the current practices of farmers in Myanmar. Though their practices are based on historical experience (and have, for the most part, been effective), there is an opportunity for an appropriate and engaging translation of modern ecological information and solutions for farmers to update and adapt their practices to a changing ecology.

Farmers will soon need to take a much more proactive role in regards to how and when chemicals are used in their farm. A failure to do so will result in the depletion

of soil nutrients. They will also be less competitive in markets where scrutiny of pesticide use is higher (due to increased international market demand / regulatory quality controls).

Myanmar-language Assets across the Value Chain

As accessibility to international goods increases, individuals throughout the value chain will strive to keep up. Key to their empowerment is understanding how goods and services work and how to properly administer an input or practice a technique. Not only are these new entrants to the market often missing the mark in terms of their products' appropriateness (as we've discussed in the mismatch between equipment available and the nature of farms and farming in Myanmar), but often labelling, contracts, instructions, and manuals have not been translated into the Myanmar language.

For example, at the close of an interview with a successful mill owner in Shwebo, one of our team members spent time translating a contract he had received for the purchase of a new piece of equipment: a US\$200,000 paddy dryer. The contract (which was entirely in English) was not only a barrier to him growing his business, but also an opportunity for him to be taken advantage of by the manufacturer.

An Increase in Skilled & Specialised Labour

The push and pull of labour scarcity and mechanisation puts the labourer in a challenging position, and sharply in contrast to a skilled service provider or artisan such as a blacksmith. Increased education and access to training are the keys to growing the rural economy across the board. However, they will most benefit the landless and those who rely on their skills to generate income. As labour becomes scarcer and is mirrored by a reduction in the need for labour, that which is required will be specialised, skilled, and higher-paying.

Equipment Rental & Financing

The cost of modern farm equipment puts it out of reach of smallholder paddy farmers, unless they have access to equitably structured finance. While equipment companies do currently offer financing (in partnerships with banks), their terms are still challenging for smallholders to meet.

Equipment rental schemes are becoming more common, especially for high-cost machinery that is needed for short, discrete tasks (such as harvesters and threshers). However, challenges with these rental schemes range from saturated reservation periods (due to high demand around harvest or planting time) to inconsistent infrastructure to support their use (for example, wide-enough roads for a harvester to access a farmer's land). There is an opportunity for comprehensive rental solutions (machines + labour or machines + other services) to more effectively meet the needs of farmers in a cost-effective manner.

Reacting to Rapid Mechanisation

An increase in demand for farm machinery and equipment has opened up the market to more players, yet there are still significant gaps in machine/farm fit, proper financing/leasing models, and infrastructure required for effective machine use.

In each of these gaps lies an opportunity to leverage the existing ecosystem in new ways (for example, through effectively engaging local service-providers like blacksmiths). Due to the significant investment required for equipment, it is necessary to provide some kind of scaffolding for farmers to effectively and meaningfully invest in a mechanised future, as well as services to support a mechanised ecosystem.

Crop Drying & Moisture Control

Maintaining harvest quality for both paddy and other crops like sesame is a challenge given the exposure to moisture and improper access to storage. Mills are starting to invest in dryers to maintain and improve the quality of their product prior to processing, but by the time paddy reaches the mill, it's often too late. Just a couple of days of wet paddy can significantly reduce the value of a farmer's crop and render the quality of the paddy unfit for human consumption due to fungus or mold growth, rendering it useless beyond animal feed. Proper moisture management pre-harvest (through monitoring rain and weather and properly timing harvest activities) and access to dry, clean storage post-harvest can assist farmers in maintaining high paddy quality, resulting in maximum prices paid by mills.

Connection to markets

It is critical that farmers understand the market for whom they are producing.

We have seen an awareness of market demands (both in variety and the price it commands) change farmer behaviour in places like Danubyu, enabling more foresight and informed decision making on a crop-to-crop basis. Guaranteed market prices, provided by contract farming organisations, also drive similar behaviour. With increased connectivity, the possibility of connecting farmers to both market information and guaranteed sales can potentially catalyse positive behavior change.

Storage as a Way of Getting Better Price

Many farmers sell their crop immediately after harvest — when the market is lowest — to pay off debt. They are also unable to retain their crop due to a lack of

infrastructure in which to store and later mobilise it for sale. Access to secure storage (also free of environmental hazards such as exposure to rain / moisture) can potentially incentivise farmers' propensity to store some, if not all, of their paddy for later sale.

Coupled with market knowledge to take advantage of a high market, storage infrastructure can provide higher margins for farmer's crops with little to no additional cost incurred.

Maximising the Short Window between Crops

Optimising for all of the variables that contribute to a successful crop (balancing variety lifespan, weather predictions, and timing of pest infestation) often leaves farmers unable to turn around their land in time for planting of the following season's crop. Limited labour and a sparse supply of equipment to go around at harvest pose a challenge, and can result in farmers planting late or missing the opportunity to farm a full season at all. Better infrastructure for equipment-sharing, and better solutions for both harvesting and threshing may be viable. Additionally, a better means of optimising and coordinating for these in-demand periods at a regional level could alleviate additional costs and relieve farmer losses.

Specialised Financial Services

With a limited suite of financial services, investing and saving in formal financial systems is, for most, out of the question. However, even more disparate is the gap between diversification and the availability of credit products on the market.

Farmers with access only to credit products structured discreetly for crop-based activities (and even those are out of sync when it comes to principal and terms) find themselves utilizing multiple loans (often with escalating

interest rates). Farmers and other small agribusiness owners require more flexible and appropriate services to support their businesses.

Inability to Capitalize on the Market

Because of their debt, farmers are unable to capitalize on the market.

"The extreme shortage of credit leads to a glut of paddy for sale at harvest time, as farmers have to scramble to repay debts. This creates very low farm-gate prices at harvest time. Again, almost all farmers we talked to had little if any paddy left over for home consumption right after harvest because they had to sell everything at harvest time". (Dapice et al 2011)

Inability to Make Optimal Choices

In an attempt to avoid acquiring more debt, many farmers try to save on fertilisers, either by using poor-quality brands or sub-optimal amounts, which decrease both their crop yields and their income. Similarly, some have to settle on poorer quality farm machinery even though better options exist.

Debt Forgiveness

Systematic, village-wide elimination of debt has the potential to provide a financial foundation for income stability to rural families. As simple debt forgiveness will not ensure against future debt acquisition and cycles, programs and services will need to support sustainable credit practices and financial services to maintain quality of life and livelihood. Conditions for forgiveness will also need to be carefully outlined in order to protect the long-term behavioural impacts of the action.

Re-architecting Extension Services

Both government and non-governmental advisory and extension services can offer regional expertise and scientific know-how, supported by a rise in data from connectivity-related services. Success of these services requires a shift away from “top-down” teaching methodologies, towards collaborative and co-creative services, wherein the farmer is both a recipient of knowledge and a contributor to a larger body of it.

This model has been proven successful the world over to lead by example (literally, through things like example plots that effectively utilise farming practices that are already in-reach of the community). Building extension services that propagate techniques and information in an interactive and evidence-based way has the opportunity to effectively extend new practices, products, and services into the farms of smallholders.

Monitoring Farming Practices & Farm Intelligence

Across the world, products and services have improved exponentially as a result of regular and effective user engagement in their development and release cycles. Myanmar’s late entry into this landscape provides a unique opportunity to involve end users and their assets in the product- and software-development process from the beginning. This involvement has the opportunity to not only benefit both product and services companies through increased value proposition and effectiveness, and the end users, but also to create a bounty of thoughtfully collected data and analytics around farms, farmers, and farming practices.

The relative affordability of modern sensing technologies coupled with the increased prevalence of cellular-data connectivity provides a solid foundation for the building of intelligent farming networks and systems

that serve both the farmer, through hyperlocal and personally appropriate products and services, and greater Myanmar, by providing an unbiased and ongoing perspective on the state of the ecology, crops, and practices.

Appropriate Mobile Services

Farmer-focussed mobile products are beginning to enter the scene, although the lack of consideration for the specific needs of the farmer—e.g., for offline access, hyper-locally relevant content, and accessible / non-scientific language—cause most to miss the mark. We have met farmers who use Facebook to follow agronomists, or research farm information, and use voice, SMS or Viber to check market prices, yet there is a thirst for more, better (objective / non-sales-related) content and services.



REFERENCES

Asia Development Bank. *Addressing Climate Change and Migration in Asia and the Pacific*. Rep. Mandaluyong City, Philippines: ADB, 2012. Print.

Asia Development Bank. *Myanmar: Agriculture, Natural Resources, and Environment Initial Sector Assessment, Strategy, and Road Map*. Rep. Mandaluyong City, Philippines, 2013. Print.

Badibanga, Thaddee., Diao, Xinshen., Roe, Terry., Somwaru, Agapi. 2009. *Dynamics of Structural Transformation: An Empirical Characterization in the Case of China, Malaysia, and Ghana*. IFPRI Discussion Paper 00856. Washington, DC:

Baroang, Kye. *Myanmar Bio-Physical Characterization: Summary Findings and Issues to Explore*. Background Paper No 1. Center on Globalization and Sustainable Development, Earth Institute at Columbia University, June 2015. Web. 2 Mar. 2016. <http://fsg.afre.msu.edu/Myanmar/Myanmar_branded_Background_paper_1_Biophysical_Characterization.pdf>. Bruinsma, Jelle. *World Agriculture: Towards 2015/2030. An FAO Perspective*. Rep. London: Earthscan Publications, 2003. Print.

Byerlee, Derek, Dolly Kyaw, San Thein, and L Seng Kham. *Agribusiness Models for Inclusive Growth in Myanmar: Diagnosis and Ways Forward. Working paper no. 133*. Michigan State University, May 2014. Web. 24 Apr. 2015.

Chipchase, Jan. *A Guide to Running Popup Studios*. San Francisco, Field Institute. 2014, eBook.

Cho, Khin Mar. *Current Situation and Future Opportunities in Agricultural Education, Research and Extension in Myanmar. Background Paper No 5*. Michigan State University and Myanmar Development Resource Institute's Centre for Economic and Social Development, July 2013. Web. 24 Apr. 2015. <fsg.afre.msu.edu/Myanmar/myanmar_background_paper_5_july_2013.pdf>.

Dapice, David, Thomas Valleley, and Ben Wilkinson. *Assessment of the Myanmar Agricultural Economy*. Rep. Harvard ASH Center for Democratic Governance and Innovation, Mar. 2009. Web. 2 Mar. 2016. <<http://ash.harvard.edu/files/myanmar.pdf>>.

Dapice, David, Thomas Valleley, and Ben Wilkinson. *Revitalizing Agriculture in Myanmar: Breaking Down Barriers, Building a Framework for Growth*. Rep. Harvard ASH Center for Democratic Governance and Innovation, 21 July 2010. Web. 3 Mar. 2016. <<http://ash.harvard.edu/files/burma.pdf>>.

Dapice, David, Thomas Valleley, Ben Wilkinson, Malcolm McPherson, and Michael Montesano. *Myanmar Agriculture in 2011: Old Problems and New Challenges*. Rep. Harvard ASH Center for Democratic Governance and Innovation, Nov. 2011. Web. 2 Mar. 2016.

Dapice, David. *"Recapitalizing the Rural Economy." Myanmar/Burma: Inside Challenges, outside Interests*. Washington, D.C.: Konrad Adenauer Foundation, 2010. 77-85. Print.

Dapice, David. *Comments on a Proposed Rice Logistics Agency for Myanmar*. Rep. Harvard ASH Center for Democratic Governance and Innovation, Aug. 2013. Web. 24 Apr. 2014.

Dapice, David. *Rice Policy in Myanmar: It's Getting Complicated*. Rep. Harvard ASH Center for Democratic Governance and Innovation, Apr. 2013. Web. 3 Mar. 2016. <<http://ash.harvard.edu/files/ricepolicy.pdf>>.

Denning, Glenn, Kye Baroang, and Tun Min Sandar. *Rice Productivity Improvement in Myanmar. Background Paper No 2*. Michigan State University and Myanmar Development Resource Institute's Centre for Economic and Social Development, Mar. 2013. Web. 2 Mar. 2016.

Dung, Nguyen Mau. The Seed Industry in Vietnam. Rep. *International Food Policy Research Institute*, Nov. 2014. Web. 4 Mar. 2016. <<https://www.ifpri.org/publication/seed-industry-vietnam>>.

Estudillo, Joanna P. "Chapter 2: Lessons from the Asian Green Revolution in Rice." *An African Green Revolution: Finding Ways to Boost Produ.* Ed. Keijiro Otsuka. Dordrecht: Springer, 2013. 17-42. Print.

Htin Linn, Aung. "Rice Exports Resume Though Annual Target Likely to Be Missed." *Myanmar Times*. 17 Sept. 2015. Web. 2 Mar. 2016. <<http://www.mmtimes.com/index.php/business/16529-rice-exports-resume-though-annual-target-likely-to-be-missed.html>>.

Hussain, Akmal. "The Green Revolution." *The Oxford Companion to Pakistani History*. Karachi: Oxford UP, 2012. Print.

IRRI. "How to Ensure Seed Quality." *Rice Knowledge Bank*. Web. 5 Oct. 2015.

Kloeppinger-Todd, Renate, and Tun Min Sandar. Rural Finance in Myanmar. *Background Paper No 3*. Michigan State University and Myanmar Development Resource Institute's Centre for Economic and Social Development, July 2013. Web. 4 Mar. 2016. <http://fsg.afre.msu.edu/Myanmar/myanmar_branded_background_paper_3_1.pdf>.

Livelihoods and Food Security Trust Fund. *LIFT Strategy Review (2014 - 2018)*. Oct. 2014. Web. 2 Mar. 2016. <[http://www.lift-fund.org/files/uploads/documents/LIFT_strategy_\(2014-18\).pdf](http://www.lift-fund.org/files/uploads/documents/LIFT_strategy_(2014-18).pdf)>.

Lwin, Hnin Yu, Theingi Myint, Shwemar Than, Nay Myo Aung, Cho Cho San, and Tin Htut. *Role of Fertilizer Policy in Transforming Agriculture of Myanmar*. Rep. *International Food Policy Research Institute*, Nov. 2014. Web. 4 Mar. 2016. <<https://www.ifpri.org/publication/role-fertilizer-policy-transforming-agriculture-myanmar>>.

Michigan State University, and Myanmar Development Resource Institute's Centre for Economic and Social Development. *Strategic Choices for the Future of Agriculture in Myanmar: A Summary Paper Prepared for USAID/Burma*. Rep. Michigan State University and Myanmar Development Resource Institute's Centre for Economic and Social Development, July 2013. Web. 2 Mar. 2016. <http://fsg.afre.msu.edu/Myanmar/myanmar_diagnostic_report_summary_july_2013.pdf>.

Minten, Bart, K.A.S Murshid, and Thomas Reardon. *The Quiet Revolution in Agrifood Value Chains in Asia: The Case of Increasing Quality in Rice Markets in Bangladesh*. Discussion Paper 01141. *International Food Policy Research Institute*, Dec. 2011. Web. 4 Mar. 2016. <<https://www.ifpri.org/publication/quiet-revolution-agri-food-value-chains-asia>>.

Naing, T., A. Kingsbury, A. Buerkert, and M. Finckh. "A Survey of Myanmar Rice Production and Constraints." *Journal of Agriculture and Rural Development in the Tropics and Subtropics* 109.2 (2008): 151-68. Web.

Oberndorf, Robert. Legal Review of Recently Enacted Farmland Law and Vacant, Fallow and Virgin Lands Management Law: Improving the Legal & Policy Frameworks Relating to Land Management in Myanmar. Rep. *Forest Trends*, Dec. 2012. Web. 2 Mar. 2016. <http://www.forest-trends.org/publication_details.php?publicationID=3274>.

Pender, John. Agricultural Technology Choices for Poor Farmers in Less-Favored Areas of South and East Asia. Rep. *International Food Policy Research Institute*, July 2007. Web. 4 Mar. 2016. <<https://www.ifpri.org/publication/agricultural-technology-choices-poor-farmers-less-favored-areas-south-and-east-asia>>.

Prowse, Martin. *Contract Farming in Developing Countries—A Review*. Rep. Paris: Agence Française De Développement, 2012. Print.

Proximity Designs, Studio D, IMTFl and frog. *Afford Two, Eat One: Financial Inclusion in Rural Myanmar*. Yangon: Proximity Designs, 2014. Print.

Proximity Designs. *Rice Crop Protection and Yield Improvement Techniques (Translated: Original Title in Burmese)*. 2nd ed. Yangon: Proximity Designs, 2015. Print.

Reardon, Thomas., Timmer, C.Peter.. 2014. *Five Inter-linked Transformations in the Asian Agrifood Economy: Food Security Implication*. Global Food Security. <http://dx.doi.org/10.1016/j.gfs/2014.02.001>

Republic of the Union of Myanmar. Department of Population, Ministry of Immigration and Population. *The 2014 Myanmar Population and Housing Census: The Union Report*. Vol. 2. 2015. Print.

Republic of the Union of Myanmar. Ministry of Agriculture and Irrigation. *Department of Agriculture End of Year Report 2011-2012*. By Ministry of Agriculture and Irrigation. 2013. Print.

Republic of the Union of Myanmar. Ministry of Agriculture and Irrigation. *Myanmar Rice Sector Development Strategy*. By Ministry of Agriculture and Irrigation. 2015. Print.

Republic of the Union of Myanmar. National Natural Disaster Management Committee. *Situation Report 4, 2 September 2015*. 2 Sept. 2015. Web. 2 Mar. 2016. <http://reliefweb.int/sites/reliefweb.int/files/resources/NNDMC_sitrep_4_20150902_final.pdf>.

Sombilla, Mercedita A., and Karen Quilloy. *Strengthening the Philippine Rice Seed System*. Rep. International Food Policy Research Institute, Nov. 2014. Web. 4 Mar. 2016.

Thang, Tran Toan. *Fertilizers in Vietnam*. Rep. International Food Policy Research Institute, Nov. 2014. Web. 4 Mar. 2016. <<https://www.ifpri.org/publication/fertilizers-vietnam>>.

The Economist. "A Bigger Rice Bowl." The Economist. 10 May 2014. Web. 25 June 2015.

The Rice Trader. "THE 7th ANNUAL – RICE TASTING CONTEST 2015." 7th Annual TRT World Rice Conference. Web. 02 Mar. 2016.

Thein, Cherry. "Coordination Key to Flood Recovery: NGOs." Myanmar Times (21 Aug. 2015). 21 Aug. 2015. Web. 2 Mar. 2016. <<http://www.mmmtimes.com/index.php/national-news/16106-coordination-key-to-flood-recovery-ngos.html>>.

Titapiwatanakun, Boonjit. *The Rice Situation in Thailand*. Rep. Asia Development Bank, Jan. 2012. Web. 4 Mar. 2016. <<http://www.adb.org/projects/documents/rice-situation-thailand-tacr>>.

Tran, Thi Ut, and Kei Kajisa. "The Impact of Green Revolution on Rice Production in Vietnam." The Developing Economics XLIV.2 (2006): 167-89.

Tun, Soe, Ye Min Aung, and Larry Wong. "Rice Business Development in Myanmar: Towards Comprehensive Agriculture and Rural Development." Proc. of NESAC-KRC-APAP "Business as Partner in Development: Workshop, Aye Thar Yar Resort, Taunggyi. 2014. Print.

United Nations Conference on Trade and Development. World Investment Report 2009: Transnational Corporations, Agricultural Production and Development. Rep. July 2009. Web. 2 Mar. 2016. <http://unctad.org/en/docs/wir2009_en.pdf>.

Ward, Patrick S., David J. Spielman, David L. Ortega, Neha Kumar, and Sumedha Minocha. Demand for Complementary Financial and Technological Tools for Managing Drought Risk. *Discussion Paper 01430*. International Food Policy Research Institute, Mar. 2015. Web. 3 Mar. 2016. <<https://www.ifpri.org/publication/demand-complementary-financial-and-technological-tools-managing-drought-risk>>.

FIGURES & ARCHETYPES

Wong, Larry, and Eh Mywer Aye Wai. *Rapid Value Chain Assessment: Structure and Dynamics of the Rice Value Chain in Myanmar. Background Paper No 6*. Michigan State University and Myanmar Development Resource Institute's Centre for Economic and Social Development, Mar. 2013. Web. 2 Mar. 2016. <http://fsg.afre.msu.edu/Myanmar/Myanmar_branded_background_paper_6.pdf>.

Woods, Kevin. *Commercial Agriculture Expansion in Myanmar: Links to Deforestation, Conversion Timber, and Land Conflicts*. Rep. Washington, D.C.: Forest Trends, 2015. Print.

World Bank. *Enabling the Business of Agriculture: Progress Report*. Rep. Washington, D.C.: World Bank, 2015. Print.

World Bank. *Myanmar: Capitalizing on Rice Export Opportunities*. Washington, D.C.: World Bank, 2014. Print. Economic and Sector Work Report Number 85804

Young, Kenneth B., Gail L. Cramer, and Eric J. Wailes. *An Economic Assessment of the Myanmar Rice Sector: Current Developments and Prospects*. Rep. Arkansas Gloabl Rice Project, Feb. 1998. Web. 4 Mar. 2016.

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