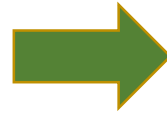


The Challenges in Establishing a Private Fertilizer Quality Assurance Laboratory in Myanmar

Prepared by Zaw Win Min

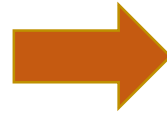
Objectives of the presentation

share knowledges and experiences



to private sector whom might want to set up a fertilizer testing laboratory

help newly establishing fertilizer testing laboratory



to avoid problems and limitations encountered by Myanmar Awba

encourage private sector companies



for the establishment of fertilizer quality assurance laboratory

Fertilizer use and its impacts

Exhausted soil



- Increasing needs of fertilizer and costs of production

Positive impacts of fertilizers

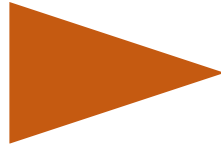
- Increase agricultural production
- Improve food security for millions of people

Negative impacts of fertilizers

- Spoil ground water sources
- Increases eutrophication of lakes streams and rivers

Fertilizer use and its impacts

Inefficient use of fertilizer



- increase production cost without leading to improved production

Farmers' practices in fertilizer use

Consequences of those practices

- Purchase on credit



- increased indebtedness

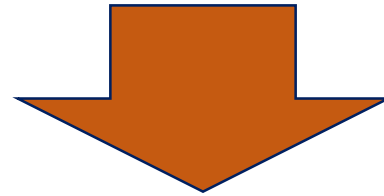
- The choice for type and amount



- based on observations of farmers in their villages with neighbors, friends and family

Problems encountering in fertilizer business

- Mixing of poor and good quality fertilizers
 - Re-bagging or repacking



Point of Sources



Unknown sources
Unknown quality

Attention!!!!

- Farmers need to be protected from poor quality fertilizers



AWBA's Objectives of setting up a fertilizer testing laboratory

- ✓ The company itself is obligated to fulfill public demands for the quality of fertilizers in the market
- ✓ The number of accredited laboratories is too small to analyse a reasonable number of samples to be able to accept good quality fertilizer or reject poor quality fertilizer
- ✓ To make sure that all the products of the company are in line with existing laws like fertilizer law
- ✓ The government is to conduct regular checks on quality of fertilizers and to punish the companies that don't adhere to the law

Site Selection

The laboratory is located in Shwe Lin Pan industrial zone on the west bank of Hlaing river. Laboratory was built on the space about $\approx 100 \text{ m}^2$ between a factory and a warehouse.

Strengths

- Close to Myanma Awba's bulk fertilizer blending factories and warehouse
- Sampling of both bulk blended fertilizers and imported fertilizers as well as raw materials are a lot easier
- Information flow among respective teams is quite fast

Weaknesses

- Far from Yangon City (about 1.5 hrs drive from eastern Townships of Yangon)
- The laboratory's staffs have to spend about 3-4 hrs (half of their daily official working time) on the car for an every day round trip
- The electricity frequently went out and made the analysis difficult to get stable conditions

LABORATORY BUILDING

Available spaces of Laboratory building

Partition	Space (m ²)
Sample preparation room	34.06
Staff room	17.73
Storage and equipment room	25.74
Entrance space	5.79
Total available space	83.32



LABORATORY BUILDING

Strengths

- Mobile and it is therefore advantage to relocate anyplace
- High quality, and durability of the building is comparable with brick and concrete building

Weaknesses

- Expensive (≈ 665 lks MMK)
- It has been vibrating when heavily loaded tucks and folk clip are moving around
- Need to be modified for electricity and water supply

SELECTION OF LABORATORY EQUIPMENT

SELECTED LABORATORY EQUIPMENT AND SUPPLIERS

No.	Instruments	Quantity	Price Offer (MMKs)	Delivery	Brand	Supplier Company	Total Cost
1	Kjeldahl Digestion Assembly	1	12,400,000	Sea freight	Gerhardt (Germany)	AMTT	22,250,000.00
2	Nitrogen distillation Assembly	1	9,850,000	Sea freight			
3	Fume hood	1	7,497,000	Sea freight	Labtech (Korea/Indo)	AMTT	7,497,000.00
4	Mechanical Shaker	1	2,800,000		Human-Lab (Korea)	NANOVA	2,800,000.00
5	Distilled and Deionized Water Assembly	1	1,728,000	Sea freight	Boeco (Germany)	AMTT	1,728,000.00
6	pH meter	1	1,000,000		Horiba (Japan)	NANOVA	1,000,000.00
7	Conductivity meter	1	1,000,000		Horiba (Japan)	NANOVA	1,000,000.00
8	Oven	2	2,458,000		Labtech (Korea)	AMTT	2,458,000.00
9	Analytical balance	1	1,125,000		Shimadzu-Japan	AMTT	1,125,000.00
10	Digital balance (display 0.1g)	1	291,000		Shimadzu (Japan)	AMTT	291,000.00
Grand Total							39,024,000.00

LIST OF LABORATORY FURNITURE AND PRICE TOTAL PURCHASED FROM LOCAL COMPANY

No.	Items	Price (Ks)	Discount (Ks)	Total Price (Ks)
1	Lab table (Central and Side)	9,400,000	940,000	8,460,000.00
2	Store Cabinet (5W*2D*7H ft ³)	1,930,000 x 2	-	3,860,000.00
4	Store Cabinet 2 (5W*1.5D*6H ft ³)	1,240,000	-	1,240,000.00
5	Table with granite top-metal frame	320,000 x 2	-	640,000.00
6	Glass tube holder	990,000 x 2	-	1,980,000.00
Grand Total				16,180,000.00

LIST OF FURNITURE FOR LABORATORY STAFF OFFICE AND TOTAL COST

No.	Items	Unit Price (Ks)	Quantity	Total price (Ks)
1	Manager Table	930,000	1	9300,000.00
2	Staff Table (2 units)	910,000	1	910,000.00
4	Staff Table (3 units)	1,380,000	1	1,380,000.00
5	Lab Table Chair	70,000	5	350,000.00
6	Staff Chair	125,000	5	625,000.00
7	Manager Chair	270,000	1	270,000.00
Total Cost				12,835,000.00

PURCHASING SELECTED EQUIPMENT

Some example of delay delivery of equipment from selected suppliers

No	Specification	Model	Brand	Country of Origin	Qty	Proposed Delivery Period	Estimated Delivery Date	Contract Signing Date	Due Delivery Date	Delay period
1	Kjeldahl Digestion Assembly	KT-8S	Gerhardt	Germany	1	within 2.5 months	15.3.17	15.12.16	28.2.17	2 weeks
2	Scrubber Unit	Turbosog	Gerhardt	Germany	1	within 2.5 months	15.3.17	15.12.16	28.2.17	2 weeks
3	Nitrogen distillation assembly	VAP-200	Gerhardt	Germany	1	within 2.5 months	15.3.17	15.12.16	28.2.17	2 weeks
4	Fume hood	LPH-2120V	Labtech	Korea	1	within 3-4 months	14.3.17	15.12.16	15-30.3.17	in time
5	Water Distiler	WS 4000	Boeco	Germany	1	within 2.5 months	7.3.17	15.12.16	28.2.17	1 week
6	Deionizer	DS 450	Boeco	Germany	1	within 2.5 months	7.3.17	15.12.16	28.2.17	1 week
7	Oven	LDO 060E	Labtech	Korea	2	stock in hand	31.3.17	15.12.16	28.2.17	3 week
8	Analytical Balance	ATX 224	Shimadzu	Japan	1	stock in hand	stock in hand	15.12.16	ok	no
9	Digital Balance	ELB 3000	Shimadzu	Japan	1	within 3-4 months	stock in hand	15.12.16	ok	no

STAFF RECRUIMENT

- A team leader
- A laboratory supervisor
- Three laboratory assistants



Main Function of the Laboratory

Since the quality assurance laboratory was primarily aimed to assure the quality of fertilizers produced by Myanmar Awba and also imported from abroad, the main functions of laboratory are chemical analysis as well as physical analysis of fertilizers and imported raw materials



Analytical tasks

Chemical Analysis

Total Nitrogen

Ammoniacal Nitrogen

Nitrate Nitrogen

Total Phosphorus

Water Soluble Phosphorus

Water Soluble Potassium

Sulfur

Calcium

Physical Analysis

Moisture Content

Granularity



ANALYTICAL METHODS

KJELDAHL METHOD FOR DETERMINATION OF NITROGEN

- ✓ Organic nitrogen was digested with H_2SO_4 using CuSO_4 and K_2SO_4 catalysts
- ✓ Nitrate nitrogen was reduced to ammoniacal nitrogen catalyzed by Devarda's alloy
- ✓ The ammoniacal nitrogen was distilled in base condition and the distillate was received in 4% boric acid solution with mixed indicator of bromocresol green and methyl red indicator and then titrated against standard HCl



METHODS FOR DETERMINATION OF PHOSPHORUS AND SULFUR

- ✓ Phosphorus was precipitated as quinolinium phosphomolybdate using quimociac reagent and sulfur was precipitated as BaSO_4 and, then the amount of precipitates was determined gravimetrically
- ✓ Later, UV visible spectrophotometer was used for analysis of P_2O_5 and sulfur
- ✓ Phosphorus and sulfur containing samples were digested and coloured with respective compounds (ammonium metavanadate for P_2O_5 and, gum acacia and BaCl_2 for Sulfur)
- ✓ KH_2PO_4 was used as standard for P_2O_5 whereas K_2SO_4 was used for Sulfur
- ✓ Detection was achieved at wavelength in visible region (436 nm for P_2O_5 and 420 nm for Sulfur)



METHODS FOR DETERMINATION OF POTASSIUM AND CALCIUM

- ✓ Potassium was precipitated as potassium tetraphenylborate
- ✓ Precipitate of potassium tetraphenylborate was gravimetrically determined after oven drying
- ✓ Volumetric analysis of Ca with standard EDTA at pH >10 was adapted for determination Ca. EDTA was first standardized with standard CaCO_3



LIMITATIONS WHILE DEVELOPED METHODS

- ✓ Determination of P_2O_5 , K_2O and S by gravimetric method was somewhat laborious and time-consuming processes
- ✓ The quality of reagents used for precipitation process was uncertain and, thus, the analysis was disturbed by uncertified reagents available in Myanmar local market
- ✓ The quality of ground water was too poor to operate (esp. in distillation assembly) the analytical equipment



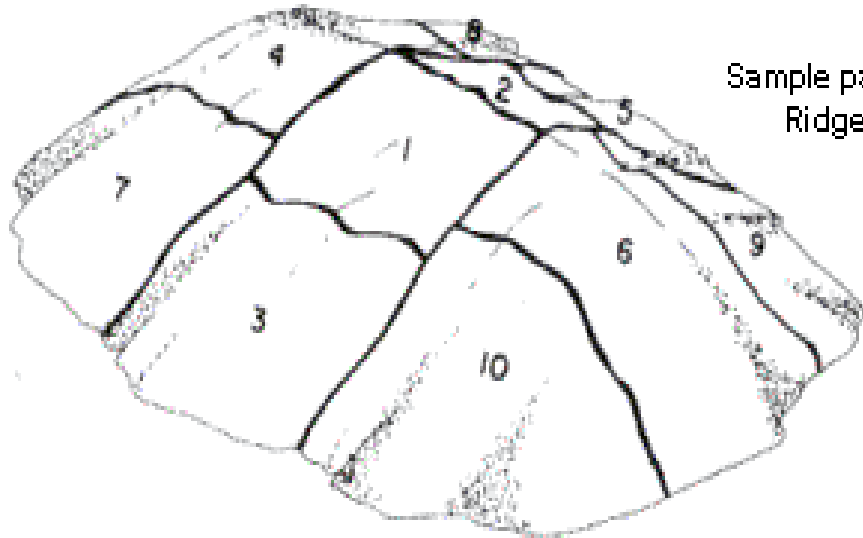
SAMPLING METHODOLOGY

Sample details

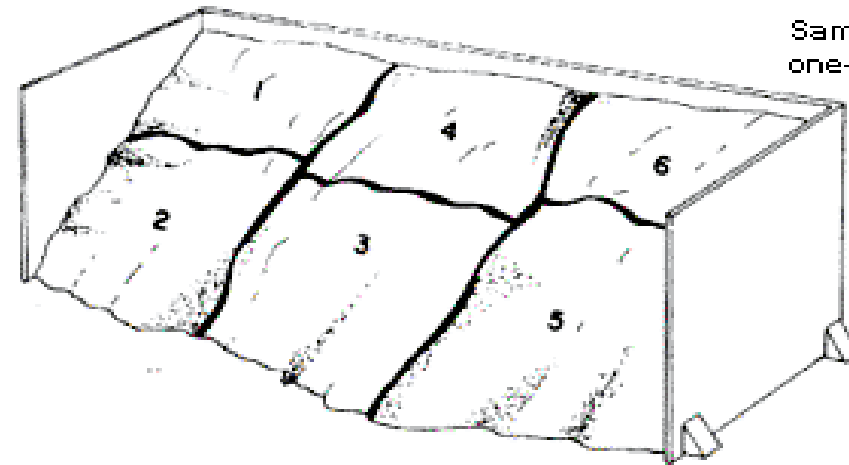
Number of bags to be selected for sampling depending upon lot size

No. Description	Lot size (No. of bags) (N)	No. of bags to be selected for sampling (n)
1 Sample Name	< 10	1
2 Arrival date	10 – 100	2
3 Container number	100 – 200	3
4 Batch number	200 – 400	4
5 BL number	400 – 600	5
6 Amount arrived	600 – 800	6
7 Sample type (liquid/powder/gravel)	800 – 1000	7
8 Brand name and Name of dealer/manufacturer/exporter	1000 – 1300	8
9 Name of inspector who collected sample	1300 – 1600	9
10 Warehouse location	1600 – 2000	10

SAMPLING FROM BULK STORAGE PILE AND ONE SIDED PILE



Sample pattern for
Ridge Pile



Sample Pattern for
one-sided

Withdraw one vertical core of material from
location 1 and 6, and
two cores from locations 2,3,4 and 5.

Sampling Probe

- ✓ The probe may whether comprise of a slotted single tube with cone tip made of stainless steel or brass or double tubes with partition
- ✓ The length of the probe may be approximately 60 to 65 cm and the diameter of the probe may be approximately 1.5 to 2 cm and the slot width 1.2 to 1.5 cm



CONCLUSION

- Purchasing of necessary lab equipment took 3-5 months.
- Laboratory furniture can be made by a local company.
- It is somewhat difficult to recruit qualified laboratory staffs outside of the government departments.
- Analytical methods used for fertilizer testing should be official ones and well validated.
- Some of locally available reagents are unreliable in quality and interfere the analysis.
- Sampling methodology should be well set up so that analytical sample is a representative of the whole bulk/bag fertilizers. One reference sample should be retained for every test sample.

Major costs for establishment of a fertilizer testing laboratory

Kinds	MMKs
Building	67,700,000.00
Lab equipment	53,524,000.00
Glassware	12,400,000.00
Lab furniture	17,320,000.00
Office furniture	12,835,000.00
Total Cost	163,779,000.00



Thank you !!!!!