MEDEA: Metrology – Enabling Developing Economies in Asia

ACTIVITY REPORT FOR TRAINING COURSE ON TRACEBILITY OF RICE MOISTURE MEASUREMENT

Dates: 3–7 December 2018

Venue: Eastern Weights and Measures Center (EWMC), Chonburi, Thailand

Host: Central Bureau of Weights and Measures (CBWM), Thailand

Trainers: Mr Surachai Sungzikaw, BWM, Thailand

Ms Haslina bte Abdul Kadir, NMIM, SIRIM, Malaysia

Mr Norihiro Yoshida, Kett Electric Laboratory, Japan

Ms Mihoko Yabe, Kett Electric Laboratory, Japan

APLMF Rep: Mrs Marian Haire

1. Introduction

Grain moisture is an important area of measurement in legal metrology that is closely related to international trade and quality of life**.** In order to improve confidence in this field within the region, the APLMF Working Group on Quality Measurement on Agricultural Products **(**QMAP**)** planned and delivered their first Training Course organised by the new WG chairs.

2. Objective of the Training

This program was developed for participants who wish to learn about grain moisture measurement. Rice was selected as the primary product although other products were discussed. The training consisted of lectures and practical activities using rice moisture meters, drying ovens, and precise weighing instruments.

This course provided participants with the knowledge and skills to:

- understand international standards and recommendations;
- establish traceability by preparing a standard reference using the drying method; and
- verify rice moisture meters.

3. Target Group

Participants were officers and technical experts with responsibility in their national/regional authorities or research institutes to develop and implement traceability systems for rice or grain moisture measurements or responsibility for capacity building activities within their economy. On completion of this program,

participants are expected to lead the establishment of sound traceability systems within their economy by delivering training to their colleagues and supporting the development of appropriate legislation. They are also expected to report on the implementation of their action plans after 6 months.

4. Training Course Program

The preparation for this training course was quite intensive as it was the first course delivered by the re-energized QMAP Working Group. Most of the members of the QMAP WG had a role as either trainers or assistant trainers. QMAP also received specialised support from Kett Electric Laboratory from Japan, who supplied 5 experts and much of the equipment used in the training. Participants were provided with intensive training and allowed to have hands-on experience developing reference standards and using rice moisture meters. Equipment was gathered from all over Thailand, and also provided by Kett Electric Laboratory.

The training was opened by Mr Chatchai Saksilapachai, Deputy Director General of the Department of Internal Trade, Ministry of Commerce in Nonthaburi. Mr Surachai Sungzikaw representing the Central Bureau of Weights and Measures and Mrs Marian Haire, representing the APLMF Secretariat also made opening remarks. They thanked PTB, APLMF, the host economy, Dr Tsuyoshi Matsumoto and Kett Electric for all their support in making this training possible.

The participants took some time to introduce each other and to contributed to the development of a summary of each economy's implementation with respect to rice moisture meters. A summary of the economy reports is found in Annex 3.

Surachai Sungzikaw and Haslina bte Abdul Kadir presented lectures on traceability and on the oven drying method explaining how participants will prepare their samples on Day 2. Then Mr Yoshida from Kett explained how to use the moisture meter. Later Mrs Yabe, also from Kett, showed participants how they can adjust the moisture level in a sample by either adding moisture using a moistening bath or removing moisture by air drying.

For practical sessions, participants and observers were divided into 6 groups so each group had an oven and a rice moisture meter for each participant. Participants were given the opportunity to practice creating reference material covering a range of moisture levels from 10 percent to 28 percent. Each of the 6 groups was provided with 10 bags of samples covering the range of moisture levels. This allowed every participant to get direct experience with the method of developing the reference materials. They collected results throughout the practical exercises and then presented their results to the whole group on Wednesday afternoon.

Each group was supervised by an assistant-trainer as shown below:

- Group 1 Mr Sophearath Ing, National Metrology Center, Cambodia
- Group 2 Mrs Eri Wijayanti, Direktorat Metrologi, Indonesia
- Group 3 Ms Mihoko Yabe and Ms. Ayano Nakazato, Kett Electric Laboratory
- Group 4 Mr Okimasa Chikira, Kett Electric Laboratory
- Group 5 Mr Warachai Triarun, CBWM, Thailand
- Group 6 Mr Ratchapack Charoenthaipanich, Kett Electric Laboratory

CWBM demonstrated their mobile unit which will be used to verify rice moisture meters at the mill. They had just received the first of these units and were excited to start using it as it will save time for the millers. The unit has the equipment necessary to verify rice moisture meters but also contains a unit for collecting samples and vacuum packing them with either nitrogen or carbon dioxide.

There was a technical visit to C.YPB Rice Mill on Thursday, 6 December. The rice mill was located in Chachoengsao province, which was 2 hours and 30 minutes' drive from the hotel, and 2 hours' drive to Eastern Weights and Measures Centre. The rice mill allowed participants to see how rice moisture measuring instruments are used in a typical setting. The mill is periodically inspected by EWMC staff, which ensures that the mill is implementing good practises. They observed trucks arriving full of rice for the mill. First, they were weighed on a weighbridge then they went onto have a sample taken so the quality and the moisture level could be determined. The sample was cleaned to ensure there is less than 20% waste. A verified moisture meter was used to determine the moisture level (optimum value for storage of rice is around 15%), and the rice is visually inspected for qualities such as density of the grain. A price is then negotiated with the seller after which the rice is delivered to the storage area. Finally, the tare weight of the truck is obtained and a ticket issued to complete the transaction.

On Friday morning each participant shared the action plan they intend to implement when they return to their own country. They were advised their action plan would be sent to them and their Director after the training and that a follow-up email will be sent in 6 months asking them to report on their progress against their plans.

A round table discussion was also held to determine the future directions for the work of QMAP. Data was collected about what products each economy monitors as a legal measurement. The following table describes the main products within the region:

Economy	Product	Parameter
Thailand	Sugar cane	Sucrose content
	Cassava	Starch content

	Rubber	Density
	Corn	Moisture
	Palm oil	Viscosity
Cambodia	Black Pepper	Moisture
	Rubber	
	Corn	Moisture
	Cassava	Starch content
	Sugar cane	Sucrose content
	Palm oil	Viscosity
Malaysia	Coffee beans	Moisture
	Rubber	
	Honey	Moisture
	Black pepper	Moisture
	tea	Moisture
	Sugar cane	Sucrose content
	Palm oil	Viscosity
Sri Lanka	Rubber	
	Corn	Moisture
Indonesia	Wood	Moisture
	Corn	Moisture
	Coffee bean	Moisture
	Clove	Moisture
	Sugar cane	Sucrose content
	Soy bean	Moisture
	Rubber	
Laos	Corn	Moisture
	Coffee beans	Moisture
	Sugar cane	Sucrose content
	Rubber	
Vietnam	Corn	Moisture
	Black pepper	Moisture
	Coffee beans	Moisture

	Rubber	
	Palm oil	Viscosity
	Sugar cane	Sucrose content
Myanmar	Sesame seed	Moisture
	Peas	Moisture
	Coffee beans	Moisture
	Corn	Moisture
Philippines	Sugar cane	Sucrose content
	Coffee beans	Moisture

The working group will analyse the products in the table and will target a new product for the next series of workshops. This will be based on the availability of an expert to provide input, and a host who might have sufficient facilities to allow for training to occur. It's most likely the next step will be to deliver a workshop with a visiting expert in the chosen field. The working group are proposing that next year they focus on corn and sugar.

Haslina bte Abdul Kadir also presented a lecture on measurement uncertainty on the last day. This was an added bonus which was very well received by the participants.

A full copy of the program can be found at Annex 4 with photographs at Annex 5.

5. Highlights/ Lessons Learned

The participants agreed the inclusion of so much practical was the most beneficial part of the course. Some participants requested an even longer course and to increase the number of rice moisture meters per participant so they got expereince with both types of meters. They also suggested we should have split up participants from the same economy. Participants agreed they had more confidence after the training and many of them agreed to train their colleagues when they return to their economies.

All participants rated all the logistics as either good or excellent. There were no negative comments about any logistics. Benjamas Winja and her team very capably managed all the logistics both before and during the training.

When asked what they learnt participants said they learnt a lot but many mentioned they now understood ISO 712 and how to prepare a primary and secondary standard, how to precondition moisture and the best drying method when using the oven. The skills gained will be used to train others, improve existing laboratory practice and to implement regulations with respect to rice moisture meters. Generally

all participants shared that the training will assist them to improve existing practices in their economy. They also expressed a high degreee of satisfaction with the course and thanked MEDEA, APLMF and the trainers for their hard work in delivering such an excellent course.

The objectives of the training were certainly achieved, and the training ran very smoothly with all members of both the working group and the Thai administration team working cooperatively throughout the week.

It was very positive to have representatives from Khon Kaen University and also from National Institute of Metrology Thailand (NIMT) present at the training as there are many opportunities to improve existing systems with their input. This will also provide feedback that can be forwarded to the ASEAN WG 3 on Legal Metrology and the ASEAN Expert Group on Metrology. This was very innovative and allowed for discussion which covered the full range of organisations that manages rice in Thailand. Of particular interest is how NIMT may be able to work with CBWM especially in the production of reference materials and the management of a proficiency scheme.

6. Next Steps/ Follow-up

- QMAP WG to plan and develop a new training program or workshop for 2019
- Provide additional support for WG as they develop new areas
- WG to consider who will host the next workshop or training course
- Follow up with NIMT to see if there are other opportunities for legal and scientific metrology to work together.

Annex 1: Workshop Program

Training Course on Traceability in Rice Moisture Measurement
3-7 December 2018 at Pattaya, Thailand

Date	Place	Time	Description
Sun, 2 Dec	Pullman Pattaya G	18:00-22:00	Dinner: International Buffet Dinner @ Pool Bar
Mon, 3 Dec	Pullman Pattaya G	08:30-09:00	Registration
		09:00-09:30	Opening addresses by APLMF, and host. A group photo.
		09:30-09:45	Explanation of schedule and outline (Haslina)
		09:45-10:45	Economy reports (APLMF).
		10:45-11:15	Coffee / tea break
		11:15-12:30	Traceability and metrological control system on grain moisture measurement, including APLMF Guide Document on Rice Moisture Measurement, OIML R59 and ISO 7700 (Surachai)
		12:30-13:30	Lunch: International Buffet Lunch @ Bua Sawan Lunch Beach Club Restaurant
		13:30-14:00	Continue the Traceability and metrological control system (Surachai)
		14:00-14:30	Lecture on a drying method using ISO 712 (Haslina)
		14:30-15:15	Lecture on Uncertainty in Legal Metrology and Grain Moisture Measurement (Haslina)
		15:15-15:45	Coffee / tea break
		15:45-16:30	Lecture on Moisture adjustment, and preparation of reference samples (Haslina)
		16:30-17:00	Lecture on how to use moisture meters (Yoshida, Chikira)
	Moom Aroi Seafood Restaurant	18:00-20:00	Welcome dinner hosted by DIT @ Moom Aroi Seafood Restaurant
Tue, 4 Dec	EWMC	08:30	Leave the hotel by bus provided by the host.
		09:00-09:30	Demonstration on Preparation of Reference Samples (Haslina, Yabe)
		09:30-12:00	Instruction, demonstration and practice on an oven method (ISO 712) in groups using one oven/group (Haslina, Yabe). (oven start at 11.05); Continue the demonstration of moisture adjustment.
		12:00-13:00	Thai Buffet Lunch @ EWMC
		13:05	Out of oven and cool down
		13:10-13:40	Demonstration on how to use moisture meters (Yoshida, Chikira)
		13:40	Continue the ISO 712(Measure the can's weight)
		14:00-15:00	Practice the master meter
		15:00-15:30	Coffee / tea break
		15:30-16:30	Continue to practice the master meter

		16:30-17:00	Data analysis and Calculation of ISO 712 (Haslina);
		17:30	Back to the hotel by bus.
	Pullman Pattaya G	18:00-22:00	Dinner: International Buffet Dinner @ Bua Chompoo
Wed, 5 Dec	EWMC	08:30	Leave the hotel by bus.
		09:00-09:30	Evaluation of master meter calibration curve (Surachai); Evaluation of uncertainty (Haslina)
		09:30-09:45	Instruction on meter-to-meter calibrations (Haslina, Warachai, and all trainers).
		09:45-12:00	Repeat ISO 712 method (oven start at 11.05); Practice of meter-to-meter calibration between the master and working meters. (all trainers)
		12:00-13:00	Lunch: Thai Buffet Lunch @ EWMC
		13:05	Out of oven and cool down
		13:10-14:30	Practice meter-to-meter calibration between the master and working meters.13:40 Continue the ISO 712 (Measure the can's weight)
		14:30-15:00	Coffee / tea break
		15:00-17:00	Summary of the measurement results (all trainers). Data analysis and Calculation of ISO 712 (Haslina); Evaluation of master meter calibration curve (Surachai); Evaluation of uncertainty (Haslina)
		17:30	Back to the hotel by bus
	Pullman Pattaya G	18:00-22:00	Dinner: Thai BBQ Seafood Buffet @ Pool Bar
Thu, 6 Dec	C.YPB Rice Mill	07:30	Leave the hotel by bus.
		07:30-12:00	Technical tour @ C.YPB Rice Mill
		12:00-14:00	Lunch: Lunch box on the bus
	EWMC	14:00-15:00	Report of the measurement results by each group.
		15:00-15:30	Coffee / tea break
		15:30-17:00	Summary discussion for the future (Chairs: Surachai, Haslina)
	The Glass House Pattaya	18:00-20:00	Farewell dinner hosted by MEDEA @ The Glass House Pattaya
Fri, 7 Dec	EWMC	08:30	Leave the hotel by bus
		09:00-12:00	Discussion on future directions and action plans related to Quality Measurement on Agricultural Product (Surachai, Haslina, Marian)
		12:00-13:00	Lunch: Thai Buffet Lunch @ EWMC
		13:00-13:30	Closing ceremony with bestowal of the certificates
		13:30	Back to the hotel by bus.
	Pullman Pattaya G	18:00-22:00	Dinner: International Buffet Dinner @ Pool Bar

Annex 2: List of Participants

First-Last name	Institute	Economy
Mr Kanjur Wangdi	Bhutan Agriculture and Food Regulatory Authority	Bhutan
Ms. Tashi Youden	Bhutan Standarts Bureau	Bhutan
Mr Vann Mao	National Metrology Center of Cambodia	Cambodia
Mr Seng Ratanak	National Metrology Center of Cambodia	Cambodia
Mrs Luthfiana Asry A'yuni	Directorate of Metrology	Indonesia
Mrs Luluk Lailatul Badriyah	Ministry of Trade	Indonesia
Mrs Mamere Tekitau	Ministry of Commerce, Industry and Cooperative	Kiribati
Ms. Taateri Temaaka	Ministry of Commerce, Industry and Cooperative.	Kiribati
Mr Anousone Sihapanya	Department of Standartization and Metrology	Laos
Mr Om Keoboutda	Department of Standartization and Metrology	Laos
Mr Adlan Akram Mohamad Mazuki	SIRIM Berhad	Malaysia
Mr Khaltarmaa Battur	Mongolian agency for standart and metrology	Mongolia
Mrs Undram Otgonbayar	Mongolian agency for standart and metrology	Mongolia
Mr Win Tint	Department of Research and Innovation, Ministry Education	Myanmar
Mrs Cho Mar Lwin	Department of Research and Innovation, Ministry Education	Myanmar
Mr Frederick Bueno	Industrial Technology Development Institute	Philippines
Mr Assanar Lebbai Nawsath	Measurement Units Standards and Services Department	Srilanka
Mr Imiya Patirannehelage Janaka Wewala	Measurement Units Standards and Services Department	Srilanka
Mrs Hathairat Kasan	Weights and Measures Branch Bureau at Kamphaengphet	Thailand
Mr Bunlum Kaiyasit	North Eastern Weights and Measures Center (NeWMC)	Thailand
Mrs Thasorn Singhaneti	National Institute of Metrology Thailand (NIMT)	Thailand

Ms. Dr. Cheerapa Boonyakong	National Institute of Metrology Thailand (NIMT)	Thailand
Mrs Sam Le Thi Thuy	Directorate for Standards, Metrology and Quality	Vietnam
Mr Tuyen Nguyen Cao	Quality Assurance and Testing Center 2	Vietnam

Annex 3: Economy reports

Economy	Law	Who verifies	Verification period	Type approval	OIML R59 Implemented	APLMF Guide 6 implemented	Other agricultural products implemented	New agricultural products want to implement	Problems	Anything else
Bhutan	No	Inspectors	Grain: 2 years	No	Not implemented	Not implemented			-Training (technical) for the officials -Investment in equipment	-Intend to start implementing rice moisture in 1 y
Cambodia	Yes	Inspectors/3rd Party	Grain 1 year	Yes	Partially	Partially		Lack of policy for development	-Limited human resources -low financial support -need skilled trainers -lack of technical docs	-Developing technical regulation and procedures for RMM
Indonesia	Yes	Inspectors	Grain/RMM 1 year	Yes	Partially	Partially		moisture level in corn.	-Limited human resources, -Geographical conditions, -Availability of reference materials	-Infrastructure not adequate in all regions -Will adopt OIML R-59 2016
Kiribati	Yes	Inspectors	Grain N/A	Yes	Not implemented yet	Not implemented yet	-copra moisture		-Financial issues -Trainer/ metrology experts required -Lack of basic measurement standards and measurement equipment	
Laos	No	No one	N/A	No	Not yet	Not yet	-	-	-	-Developing technical and regulations for RMM. -Plan to implement in2 y
Malaysia	Yes	Inspectors	None	No	Not yet	Not yet	N/A	-	N/A	-Proficiency Testing to compare oven gravimetric analysis ISO712 method
Mongolia	Yes	Inspectors	Grain 1 year	Yes	Partially	Partially	-	-	Software security/control Improve reference material Improve the specialists' skills	-Inspection/Verification /Type approval/license of measuring instruments

										-Every year we calibrated approx. 150 grain moisture meters
Myanmar	No,	Inspectors	-	No	Not yet	Partially	-	-	Need more awareness programs for inspectors, millers, exporters, traders and farmers	- have established RM testing labs -plan to establish RRM verification and type approval
Philippines	No	Inspectors	None	No	Partially	Fully implemented – both, NML and NFA follow the ISO 712.	None		-the National Metrology Board (NMB) not convened. -NML needs capacity building and facility enhancements -No Technical WG for moisture	-10% RM meter calibrated by NML -90% RM meters calibrated by National Food Authority with traceability to NML -Rice producers and millers use NML services for their resistance and capacitance type meters.
Sri Lanka	Yes	Inspectors	None	Yes	Not yet	Not yet			No laboratory facilities but they are under construction now	- Intend to implement OIML, national regulations of Sri Lanka & APLMF guide lines
Thailand	Yes	Inspectors	RMM: 2 years	No	Partially	Partially	Sugar cane	Density of rubber, starch content in cassava		-Office of the Cane and Sugar board -National Bureau of Agricultural Commodity and Food Standards
Vietnam	Yes	Inspectors/3rd party	Grain/RMM : 1 year	No -	Partially	Partially	sugar cane juice (density, refractive index, polarization	Density of rubber Moisture in coffee beans	Grinding method without heating or absorbing moisture	-RMM have initial verification

Appendix 4: Summary of Action Plans

Summary of Action Plans

MEDEA 2: Course on Verification of Rice Moisture Measurement

Pattaya, Thailand, 3-7 December 2018

Name	Economy	Action Plans
Mr Kanjur Wangdi	Bhutan	1. Share the training knowledge: Importance of Moisture determination, procedures and precautions, importance of metrology and legal metrology etc with colleagues (December 15-20 2018) 2. Calibrate and verify the moisture meter in our lab using the techniques we learned during the training course. (January -April 2019). 3. Extend the scope of determination and calibration techniques in other agricultural products. (May-June 2019). 4. Conduct Training to the relevant organization (if possible).
Ms. Tashi Youden	Bhutan	Submit report to management Share information with colleagues Recommend purchasing of equipment Develop and implement test procedures
Mr Vann Mao	Cambodia	-Report to the President of NMC; -Share knowledge with NMC's official staff; -Develop technical regulation for verification of moisture meter; -Develop technical documents related to verification of moisture meter; -Conduct additional studies and research ISO method.
Mr Seng Ratanak	Cambodia	-Share this knowledge to my all colleagues in my office -Inform this knowledge to my chief office and Director so we can improve -Use this knowledge to create technical regulation.
Mrs Luthfiana Asry A'yuni	Indonesia	1. Give a report to the Director of DoM (Directorate of Metrology)

		2. Revise the technical requirement regulation of moisture meter according to OIML R-59 (2016) 3. Coordinate discussions with BULOG (Logistic Affair Body), BPS (Center of Statistic Body) and Farmer Association about moisture meter verification handled by Legal Metrology Unit of municipal government 4. Identify the legal metrology unit of municipal governments that have moisture meter verification scope/ authority
Mrs Luluk Lailatul Badriyah	Indonesia	1. January 2019 – Make a presentation to Board of Directors including Director of Directorate of Metrology (DoM)-Ministry of Trade 2. January 2019 – Deliver presentation to 14 trainers of Center of Metrological Resources Development-Ministry of Trade 3. February-July 2019 (tentative)- Deliver training on Rice Moisture Meter to 30 students from municipal governments in Indonesia
Mrs Mamere Tekitau	Kiribati	1. Write a detailed report for the director, legal metrology. 2. Promote what has been learned and conduct in-house training for grain moisture measurement. 3. Conduct outreach awareness program such as; radio awareness, posters and pamphlet and Business/Community compliance visits 4. Recommend the implementation of measuring moisture in grain
Ms. Taateri Temaaka	Kiribati	
Mr Anousone Sihapanya	Laos	Make a presentation to my Director General for implement calibration Rice Moisture Meter in future. Prepare the regulation for Rice Moisture Meter Implement the regulation within the next 2 year (2020)
Mr Om Keoboutda	Laos	
Mr Adlan Akram Mohamad Mazuki	Malaysia	1. Increase awareness to the new stakeholder Ministry of International Trade and Industry (MITI) on important of rice moisture activities HOW 2. Urge Ministry of Agriculture (MOA) to regulate the rice moisture activity including pattern approval, calibration and verification in Malaysia 3. Carry out proficiency testing including MOA laboratory which has the responsibility for rice moisture

Mr Khaltarmaa Battur	Mongolia	1. Make a report to Director 2. Share knowledge with colleagues 3. Improve calibration and verification method 4. Share knowledge with distributers and importers of moisture meters
Mrs Undram Otgonbayar	Mongolia	
Mr Win Tint	Myanmar	Myanmar has established Rice Moisture testing Lab under the JICA project. We will: ● Report to Director ● Test various reference sample (80-100 samples) for verification of rice moisture meters ● Liase with different Ministries and private sector(miller, asso iations etc.) ● Verify to secondary rice moisture meters in 2019.
Mrs Cho Mar Lwin	Myanmar	
Mr Frederick Bueno	Philippines	1. Make a Travel Report to be submitted to our Department of Science and Technology Secretary. 2. Prepare training module: calibration/verification procedure, work instruction. 3. Prepare a training program on moisture measurement to be conducted for echo seminar/training for the NML Staff. 4. Conduct actual Echo Seminar/Training on Moisture Measurement for NML Staff. Targeting 15-20 attendees
Mr Assanar Lebbai Nawsath	Srilanka	● Provide report to the Director ● Preapre plan to implement rice moisture meters for impelmetation in 2019 ● Provide lab facilities in 2020 ● Train the staff in 2020. ● Deliver awareness programs for the community in 2020 . ● Start the verification moisture meters in 2021.
Mr Imiya Patirannehelage Janaka Wewala	Srilanka	
Mrs Hathairat Kasan	Thailand	Train weights and measures officers to verify rice moisture meters throughout 32 local branches Establish new laboratory in 2 provinces
Mr Bunlum Kaiyasit	Thailand	
Mrs Thasorn Singhaneti	Thailand	• Share knowledge with rice moisture meter users in Thailand • Discuss with CBWM regarding how to link national metrology with legal metrology
Ms. Dr. Cheerapa Boonyakong	Thailand	

		• Collaboration between NIMT and CBWM on PT (determination of moisture content in paddy) • Method: ISO 712 and ISO770 • % Moisture content: 10%, 15%, 20% • Carry out PT program • Provide CRM to CBWM • Conduct moisture meter/moisture analyzer calibration • Gain ISO 17034 accreditation for paddy CRM
Mrs Sam Le Thi Thuy	Vietnam	Propose my goverment release a legal regulation of verify agriculture equipment (Obligatory) Offer training about verify RMM for labs in many part of my country to repond quickly to farmers need
Mr Tuyen Nguyen Cao	Vietnam	

Annex 5 Photographs


www.dit.go.th


HINO
84-6921


PFEUFFER
Granomat