Report for Training Course on Traceability in Rice Moisture Measurement

Date: **16 (Mon) to 20 (Fri) November, 2015**

Venue 1 on 16th: **High Sky Hotel, Phnom Penh, Cambodia**
Venue 2 on 17-20th: **National Metrology Center, Phnom Penh, Cambodia**

Host: **National Metrology Center (NMC) of Cambodia**

Trainers: **Dr. Tsuyoshi Matsumoto, National Metrology Institute of Japan**

Mr. Norihiro Yoshida, Kett Electric Laboratory, Japan

Ms. Mihoko Yabe, Kett Electric Laboratory

Mr. Kenji Emori, Kett Electric Laboratory

Mr. Rikiya Takahashi, Kett Electric Laboratory

1 Objective of the Training

Since 2001, a series of training courses / workshops have been conducted by the APLMF Working Group (WG) on Quality Measurement of Agricultural Products chaired by NMIJ. This course was the eleventh follow-up program, which was aimed specifically at training trainers in grain moisture measurement. Rice was selected as the primary product although other products were also covered in this program. This training course was composed of lectures and practical activities.

The lectures covered:

- Basic understanding of grain moisture: traceability in grain moisture measurement;
- Understanding of related international standards / recommendations;
- Outline of standard reference method (drying method); and
- Instructions on how to use the rice moisture meters including calibration procedure.

The practical activities included the use of rice moisture meters, drying ovens and precise weighing instruments.

2 Target Group

The target group for this training course was composed of officers and technical experts in national / regional authorities or research institutes in metrology, and those who were in charge of establishing a regional traceability system for moisture measurement on capacity building activities in their economy.

3 Description of the Training Course

3.1 Opening ceremony

On Monday 16th, the training course started off with an opening ceremony at the High Sky Hotel. On behalf of the host economy, Mr. Kim Chandara (Deputy General Director of NMC) delivered an opening address. Mr. Guo Su, Mr. Phil Sorrel and Dr. Matsumoto followed the host economy and delivered addresses on behalf of APLMF and the Working Group.

3.2 Economy report

On Monday after the opening ceremony, one representative from each of the participating nine economies provided an economy report on the current situation in metrological control of grain moisture meters. Names of the representatives, who provided the report, are given below.

(1) Mrs. Chedon Tandin (Bhutan)
(2) Mr. Ing Sophearath (Cambodia)
(3) Mr. Subroto Imam Adi (Indonesia)
(4) Mr. Norihiro Yoshida (Japan)
(5) Mrs. Adnan Adlina (Malaysia)
(6) Mr. Banzragch Purevtogtokh (Mongolia)
(7) Mr. Tint Win (Myanmar)
(8) Mr. Srikhajorndet Sudchai (Thailand)
(9) Mr. Ha Thanh Thuc (Vietnam)

3.3 Lectures

In the afternoon on Monday, Dr. Matsumoto provided lectures on basic understanding of moisture measurement, traceability in grain moisture measurement, treatment of uncertainty, preparation of reference samples, OIML R59 (Moisture Meters for Cereal Grains and Oilseeds) and ISO 7700 (Food products - Checking the performance of moisture meters in use).

On Tuesday 17th, Ms. Yabe provided lectures on: (1) ISO 712 (Cereals and cereal products - Determination of moisture content - Routine reference method), (2) Japanese drying method (Determination of moisture content in Japan - Routine reference method at 105 ºC), and (3) preparation of reference samples with moisture adjustment method. Mr. Takahashi provided a lecture on basic principles and structure of the resistance and capacitance type moisture meters. Mr. Yoshida provided a lecture on moisture meters used practically in the field including procedures to calibrate, check and use the meters.

3.4 Practical activities

Practical training was provided from Tuesday 17th to Thursday 19th in the two laboratories at NMC. In the laboratories, two sets of dry ovens and precise weighing instruments were provided by NMC. A set of reference samples of paddy rice was also prepared by NMC in advance. This set of samples included 15 bags of samples at different levels of moisture content in a range from 9 % to 30 %. Moisture meters (capacitance and resistance types) for training were provided by the Kett Electric Lab.

On Tuesday 17th, Ms. Yabe demonstrated procedures of the drying method based on ISO 712 for all participants, and other trainers supported her demonstration. This ISO-based method is widely utilized as the primary reference method for grain moisture which is necessary to establish a traceability system. Since it needs a drying procedure at 130 ºC for two hours, practical activities were conducted alternately with the lectures to utilize the waiting time necessary for drying / cooling.

On Wednesday 18th, twenty participants (except observers) started a practical training of the drying method separated in two groups based on ISO 712. All trainers supervised and assisted it. Each group measured the mass of the cans containing samples carefully before and after drying. Then, moisture contents of the reference samples were computed from the differences in mass. After obtaining the reference values of moisture contents, the participants calibrated the primary moisture meters (capacitance type) against the reference values.

On Thursday 19th, the twenty participants participated in a practical training for meter-to-meter comparison. This method is necessary and efficient in order to calibrate the meters used as a working standard or used in the real field. Using the 15 reference samples, they practiced to compare the measurement results obtained by the primary meter and a secondary meter. After the measurements, the two groups provided a summary report on all measurement results obtained in the two days chaired by Mr. Yoshida and Ms. Yabe.

3.5 Summary discussion

After the summary reports on Thursday, a summary discussion on the entire training course including future directions was conducted chaired by Dr. Matsumoto. The following is a summary of the comments by the participants.

(1) A strong need for continuing training activities in rice (grain) moisture measurement particularly from the economies which participated in this course for the first time.

(2) A need for a method to prevent a fraud by cheating the moisture meters (TH*). A lecture or practice to adjust moisture meters was also requested for the local authorities in legal metrology.

(3) A need for a lecture to evaluate measurement uncertainty for rice moisture meters including provision of a worksheet for practical calculation (MY*).

(4) A more practical lecture with demonstration to adjust moisture content of grain sample (VN*)

(5) A need to cover a wider range of products including wheat, corn, soybean, coffee etc.

(6) Each trainee of the present training course should be a trainer in each economy and lead a regional training program (Dr. Matsumoto).

(7) Dr. Matsumoto called for a candidate economy to host the next program in 2016 or later. He also added that the WG welcomes additional trainers or speakers from all APLMF economies because this is an international program organized by APLMF.

* Country code in ISO 3166 (see List of Participants in Annex 2)

3.6 Technical tour

In the morning on Friday 20th, the participants visited a rice milling factory (Nom Srim Rice Mill) located 15 km south of Phnom Penh. The participants visited a facility for drying and milling the rice brought in by the farmers using a truck.

3.7 Closing ceremony

After the technical tour, the participants moved to NMC, and a closing ceremony was conducted. Dr. Matsumoto, Mr. Sorrel and Mr. Polineavith (NMC) handed certificates of attendance to all participants including observers. Dr. Matsumoto and Mr. Yoshida signed on the certificates in advance.

3.8 Materials / Documents

All training materials, economy reports, worksheets for calculation and some of the photos were provided to each economy and host staffs with USB memories. The materials will be also uploaded on the APLMF website for the benefit of all APLMF member economies.

Followings are the materials provided by the trainers (parenthesis show the file name).

(1) Economy report of Japan by Mr. Yoshida (1-Kett profile Yoshida 2015.pptx / 38 pages)

(2) Lecture by Dr. Matsumoto on general understanding of moisture measurement and traceability (2-APLMF_Rice_Moisture-Traceability-2015-Matsumoto.pptx / 79 pages)

(3) Lecture by Ms. Yabe on the drying method of ISO 712 (3-Kett_2015ISO712-Yabe.pptx / 28 pages)

(4) Lecture by Ms. Yabe on the drying method of Japan at 105 degree Celsius (4-Kett_2015JPN105DEG-Yabe.pptx / 18 pages)

(5) Lecture by Ms. Yabe on the drying method of ISO 6540 (5-Kett_2015ISO6540EN-Yabe.pptx / 30 pages)

(6) Lecture by Ms. Yabe on moisture adjustment (6-Kett_2015MoistureAdjustment-Yabe.pptx / 22 pages)

(7) Lecture by Mr. Takahashi on electrical moisture meters (7-Principle of Electronic Moisture Tester for Grain-Takahashi.pptx / 23 pages)

(8) Lecture by Mr. Yoshida on how to use moisture meters practically (8-Kett products Yoshida 2015.pptx / 10 pages)

(9) Lecture by Mr. Yoshida on how to check moisture meters practically (9-Kett Accuracy check for Rf-500 series(Rf) Yoshida 2015.pptx / 19 pages)

(10) Lecture by Mr. Yoshida on how to check moisture meters practically (10-Kett Accuracy check for PM-450 series Yoshida 2015.pptx / 20 pages)

(11) "APLMF Guide Document on Rice Moisture Measurement: First Draft" (APLMF_Guide_Rice_Moisture-151016.pdf / 55 pages). This draft was prepared by the WG at the 22nd APLMF Forum meeting in October, 2015.

In addition, all of the nine participated economies provided informative reports regarding introductions of the economy / home institute and the metrological control system on grain moisture measurement.

3.9 Support by the host economy

NMC provided all necessary transportations: (1) between High Sky Hotel and NMC, (2) to / from rice milling factory on 20th, (3) to / from the Phnom Penh Airport, and (4) to / from the restaurant for the dinner on 16th. NMC also provided lunch and tea breaks. Two official dinners were provided by Kett Electric Lab. and PTB, respectively.

4 Highlights / Lessons Learned

4.1 Were the objectives of the training course met?

Yes. All items in the objectives were explained. Some of them were also demonstrated and / or practiced on.

4.2 Was the right target group attracted by the training?

Yes. All of them were the right staffs to be invited to the present training course. However, there were English language difficulties with some participants.

4.3 Competent participants

The trainers recommended the following participants (trainees) who had sufficient competence to serve as a trainer in an international or a regional training program in the future.

Cambodia: Mr. Ing Sophearath and Mr. Yin Vanndeth (as an observer)

Malaysia: Mrs. Adnan Adlina and Mrs. Abdul Kadir Haslina

Thailand: Mr. Srikhajorndet Sudchai and Ms. Mangdindam Krongkarn

Vietnam: Mrs. Nguyen Thi Ly and Mr. Nguyen Quang Trung

4.4 What was the feedback of the participants?

A feedback form was sent from the secretariat of PTB to all participants except observers in advance by email. All of the participants sent a filled form back to Dr. Matsumoto in email or a handwritten form by the end of the training course. All participants provided favourable and appreciative comments. They seemed to understand the main objectives of the present course. Many of them requested to repeat such training program. A summary of scores for overall assessment is shown below:

Score 4 (good): 10 participants (BT, KH, MY, TH, VN)

Score 5 (excellent): 10 participants (ID, MN, MM, MY, TH, VN)

Followings are other comments provided in the feedback forms.

- ✓ More days (even 2 weeks) particularly for practical training (BT, KH, TH).
- ✓ More detailed specifications for moisture meters to be used (ID).
- ✓ More lecture / practice for preparing sample including moisture adjustment (MY, TH).
- ✓ I plan a domestic course (TH). I plan to host the next international course (VN).
- ✓ We plan a bilateral comparison between Malaysia and Thailand (MY).
- ✓ A competent trainee should be invited as a trainer (MY).
- ✓ The guide document will be an effective reference in the region (MY).
- ✓ Consider the situation in ASEAN (VN).
- ✓ Trainers are whole-hearted and passionate, but please speak slowly (VN).
- ✓ We need 45 days to get an approval to go abroad (ID).
- ✓ Send an invitation to the correct person(s) in the economy (KH).
- ✓ The hotel was isolated (MY). Need dinner every day (ID). Need a city tour (VN).
- ✓ Need another program on evidential breath analyzers (MN).

4.5 What was the feedback of the trainers?

Followings are the comments provided by the five trainers after the training course.

- ✓ Considering the fact that it was the first time for NMC to host an international training course, the support by NMC was much more than the level we expected. We deeply appreciate the kind and dedicated support by NMC.
- ✓ We also appreciated NMC for providing the technical tour on Friday. The tour however might have been more effective with some explanation or demonstration on how moisture meters were utilized in the rice milling factory.
- ✓ There was still sufficient time in the practical trainings on 17-19th. We can add more lectures / demonstrations on other grains (corn etc.) and adjustment method of moisture content of the sample.
- ✓ A method for sharing electronic documents during the course should be improved. We request APLMF or PTB provide a website or an online storage for all participants.
- ✓ Some economies did not bring a sufficient number of PCs (computers) to be used in the practice. We expect each participant has a PC because we need to use an Excel worksheet during the practice.

- ✓ Method of submission of the feedback form should be electronic to lessen the burden of the secretariat in PTB / APLMF. In this course, some participants had to submit a handwritten form due to lack of a PC. We can ask them to submit the form after going back to their home institutes. However, we do not recommend this method because they tend to forget submitting it.

- ✓ It might be better to select a hotel closer to the city center. However, we do not request it strongly because it would lead an increase of the cost.

4.6 What were the highlights of the course?

This course was the eleventh training course (or workshop) organized by the WG in APLMF. The contents of the program were therefore well established and matured. There were some competent participants (see 4.3) who would be able to serve as a trainer. It might be a good time to think about transferring this training activity to the lower level in each economy or a region.

4.7 Lessons Learned: What recommendations would you give to the MEDEA Coordination Committee and trainers of other courses?

We should think about an effective method for sharing electronic information / outcomes after the training course. Although we tentatively used a method with USB memories, this is not recommended in many institutes in developed economies for a security reason. Utilization of a website (or storage on the web) is recommended.

There is a big difference in the economies in the ability to communicate in English and to utilize IT instruments (a laptop computer). Regarding the latter, participants from some economies still do not have a private computer. Such situation might be an obstacle in practical training with Excel as well as submitting a feedback form.

5 Next Steps / Follow-up

5.1 What are the agreed next steps after the training?

As it was mentioned in 3.5, many participants requested to continue the training program in this field. The organizer understood from the conversation with the participants that there would be several candidate economies which intended to host the next training program.

5.2 What are the suggested follow-up activities?

Generally speaking, it is recommended to continue a follow-up training program. It should be noted however, there is a possibility to continue the program in a regional level not as an APLMF / MEDEA program.

Annex 1: Final Program of
Training Course on Traceability in Rice Moisture Measurement
16-20 November 2015, Phnom Penh, Cambodia

Day 1 16 Nov. (Mon) High Sky Hotel	8:30-9:00	*Registration*
	9:00-10:00	Opening addresses by APLMF, WG and host. A group photo.
	10:00-10:30	*Coffee / tea break*
	10:30-12:00	Economy reports from the participated economies.
	12:00-12:10	Explanation of schedule and outline (Matsumoto)
	12:10-13:30	*Lunch break*
	13:30-15:00	Lecture on traceability in grain moisture measurement (Matsumoto)
	15:00-15:30	*Coffee / tea break*
	15:30-17:00	Lectures on OIML R59 / ISO 7700 (Matsumoto)
	18:00-20:00	*Welcome dinner hosted by Kett Elec. Lab. Co. at the Titanic Restaurant in Phnom Penh (transportation by bus)*
Day 2 17 Nov. (Tue) NMC	8:30	Leave the hotel by bus provided by the host.
	9:00-10:00	Lectures on ISO 712, Japanese 105 ºC Method and ISO 6540 (Yabe). Instruction and demonstration of the oven method (Yabe).
	10:00-10:30	*Coffee / tea break*
	10:30-12:00	Continue the demonstration.
	12:00-13:00	*Lunch break in NMC with lunch boxes*
	13:00-15:00	Lecture on how to use moisture meters (Yoshida)
	15:00-15:30	*Coffee / tea break*
	15:30-16:30	Lectures on resistance & capacitance moisture meters (Takahashi)
	17:00	*Back to the hotel by bus.*
Day 3 18 Nov. (Wed) NMC	8:30	Leave the hotel by bus.
	9:00-10:00	Practice on ISO 712 in two groups using one oven / group
	10:00-10:30	*Coffee / tea break*
	10:30-12:00	Continue the practice
	12:00-13:00	*Lunch break in NMC with lunch boxes*
	13:00-15:00	Practice to calibrate master meters with reference samples
	15:00-15:30	*Coffee / tea break*
	15:30-17:00	Continue the practice
	17:30	*Back to the hotel by bus.*
Day 4 19 Nov. (Thu) NMC	8:30	Leave the hotel by bus.
	9:00-10:00	Summary of the measurement results by each group. Practice of comparison between the master and working meters.
	10:00-10:30	*Coffee / tea break*
	10:30-12:00	Continue the practice in the group.
	12:00-13:00	*Lunch break in NMC with lunch boxes*
	13:00-14:30	Continue the practice in the group.
	14:30-15:00	*Coffee / tea break with data analysis*
	15:00-16:30	Report of the measurement results by each group (Chair: Yoshida). Summary discussion for the future (Chair: Matsumoto)
	18:00-20:00	*Farewell dinner hosted by PTB at High Sky Hotel*
Day 5 20 Nov. (Fri) NMC	7:30-10:00	Technical tour to a rice-milling factory (Nom Srim Rice Mille) by bus
	10:00-10:30	*Back to NMC and have a coffee / tea break*
	10:30-11:00	Closing ceremony with bestowal of the certificates
	11:30-12:30	*Lunch break in NMC with lunch boxes*
	13:00	*Back to the hotel by bus. Finished all program.*

Annex 2: List of Participants

Participants					
No.	Title	Family name	Given name	Economy	Organization
1	Mrs.	Chedon	Tandin	Bhutan (BT)	Bhutan Standards Bureau (BSB)
2	Mrs.	Choden	Sonam	Bhutan	Bhutan Standards Bureau (BSB)
3	Mr.	Tamang	Suk Bahadur	Bhutan	Bhutan Standards Bureau (BSB)
4	Mr.	Channrat	Vann	Cambodia (KH)	National Metrology Center (NMC)
5	Mr.	Ing	Sophearath	Cambodia	National Metrology Center (NMC)
6	Mr.	Yim	Sovichea	Cambodia	National Metrology Center (NMC)
7	Mr.	Sumpena	Pepen	Indonesia (ID)	Directorate of Metrology (DoM), Directorate General of Standardization and Consumer Protection, Ministry of Trade of the Republic Indonesia
8	Mr.	Subroto	Imam Adi	Indonesia	Directorate of Metrology (DoM), Directorate General of Standardization and Consumer Protection, Ministry of Trade of the Republic Indonesia
9	Mr.	Mohd Zulkifli	Saidi	Malaysia (MY)	Enforcement Division, Ministry of Domestic Trade, Cooperative and Consumerism (MDTCC)
10	Mrs.	Adnan	Adlina	Malaysia	National Metrology Laboratory (NML), SIRIM Berhad
11	Mrs.	Abdul Kadir	Haslina	Malaysia	National Metrology Laboratory (NML), SIRIM Berhad
12	Ms.	Otgonbazarragchaa	Khaltar	Mongolia (MN)	Mongolian Agency for Standardization and Metrology (MASM)
13	Mr.	Banzragch	Purevtogtokh	Mongolia	Mongolian Agency for Standardization and Metrology (MASM)
14	Mr.	Dashdondov	Batsukh	Mongolia	Mongolian Agency for Standardization and Metrology (MASM)
15	Mr.	Tint	Win	Myanmar (MM)	Metrology Division, National Standards and Quality Department, Department of Research and Innovation (DRI), Ministry of Science and Technology
16	Mr.	Srikhajorndet	Sudchai	Thailand (TH)	Central Bureau of Weights and Measures (CBWM), Department of Internal Trade, Ministry of Commerce
17	Ms.	Mangdindam	Krongkarn	Thailand	Central Bureau of Weights and Measures (CBWM), Department of Internal Trade, Ministry of Commerce
18	Mrs.	Nguyen	Thi Ly	Vietnam (VN)	Vietnam Metrology Institute (VMI), Directorate for Standards, Metrology and Quality (STAMEQ)
19	Mr.	Nguyen Quang	Trung	Vietnam	Quality Assurance and Testing Center 2 (QUATEST2), Directorate for Standards, Metrology and Quality (STAMEQ)
20	Mr.	Ha Thanh	Thuc	Vietnam	Metrology Department, Directorate for Standards, Metrology and Quality (STAMEQ), Ministry of Science and Technology (MOST)

Observers					
1	Dr.	Vann	Mao	Cambodia	Legal Metrology Department (NMC)
2	Mr.	Khlaut	Ousa	Cambodia	Legal Metrology Department (NMC)
3	Mr.	Chheang	Khin	Cambodia	Legal Metrology Department (NMC)
4	Mr.	Yin	Vanndeth	Cambodia	Legal Metrology Department (NMC)
5	Mr.	Noun	Sothea	Cambodia	Legal Metrology Department (NMC)
6	Mrs.	Heng	Leakhena	Cambodia	Legal Metrology Department (NMC)
7	Mrs.	Voun	Somnang	Cambodia	Legal Metrology Department (NMC)
8	Mr.	Hem	Chamreoun	Cambodia	Industrial Metrology Department (NMC)
9	Mr.	Suy	Vannsis	Cambodia	Industrial Metrology Department (NMC)
10	Mr.	Dul	Vuthy	Cambodia	Scientific Metrology Department (NMC)
Trainers					
1	Dr.	Matsumoto	Tsuyoshi	Japan (JP)	National Metrology Institute of Japan (NMIJ)
2	Mr.	Yoshida	Norihiro	Japan	Kett Electric Laboratory
3	Ms.	Yabe	Mihoko	Japan	Kett Electric Laboratory
4	Mr.	Takahashi	Rikiya	Japan	Kett Electric Laboratory
5	Mr.	Emori	Kenji	Japan	Kett Electric Laboratory
APLMF Secretariat					
1	Mr.	Sorrell	Phil	New Zealand (NZ)	APLMF Secretariat / Trading Standards, Consumer Protection and Standards, Market Services Group, Ministry of Business, Innovation and Employment (MBIE)
2	Mr.	Guo	Su	PR China (CN)	APLMF Secretariat (former) / General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ)
Organizers from Host Economy					
1	Dr.	Laim	Kimleng	Cambodia (KH)	President, National Metrology Center (NMC), Ministry of Industry and Handicrafts
2	Mr.	Kim	Chandara	Cambodia	Deputy General Director (NMC)
3	Mr.	Ker	Sary	Cambodia	Deputy General Director (NMC)
4	Mr.	Ngi	Polineavith	Cambodia	National Metrology Center (NMC)
5	Mr.	Neak	Thyng	Cambodia	National Metrology Center (NMC)
6	Mr.	Em	Sophors	Cambodia	National Metrology Center (NMC)
7	Mr.	Seng	Kimheng	Cambodia	National Metrology Center (NMC)
8	Mr.	Bun	Bora	Cambodia	National Metrology Center (NMC)

Photographs

Group photo at NMC (19 Nov.)

Lectures in High Sky Hotel (left) and NMC (right)

Practical training in NMC

Rice milling factory (left) and farewell dinner (right)