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SUstainable developmeNT Smart Agriculture Capacity
« SUNSpACe »

Make the training programme eligible

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Table 1: List of Abbreviations

Term / Abbreviation	Definition
AEC	Acme Engineering College
BAC	Bhutan Accreditation Council
BVQF	Bhutan Vocational Qualifications Framework
CAC	College Academic Committee
CMU	Chiang Mai University
CPD	Continuing Professional Development
CTEVT	Council for Technical Education and Vocational Training
ISO	International Organization for Standardization
KEC	Kantipur Engineering College
KKU	Khon Kaen University
MoE	Ministry of Education
MoLHR	Ministry of Labour and Human Resources
NQF	National Qualifications Framework
NSTB	National Skills Testing Board
NVQF	National Vocational Qualifications Framework
OEC	Office of the Education Council

OVEC	Office of the Vocational Education
QAAC	Quality Assurance and Accreditation Council
RUB	Royal University of Bhutan
SDP	Skills for Development Programme
SLC	School Leaving Certificate
TPQI	Thailand Professional Qualifications Institute
TVET	Technical and Vocational Education and Training
VET	Vocational Education and Training

Table Document History

Date	Name	Description
14/02/2020	UWS	First draft based on information collected from partners and collaborative work during the skype meeting
14/04/2020	UWS	First shared draft, including feedback from Asian partners
14/06/2020	UWS	Second shared draft, including additional work on past approaches
10/09/2020	UWS	Pre-Final version, including comments from partners and additional details regarding the progress tasks of WP3 and WP2.
10/11/2020	All	Review by partners
10/01/2021	All	Revise updates on pre-final version
10/03/2021	UWS	Validation
10/06/2021	UWS	Final Version
04/12/2022	ULL	Revised and closed

1   Introduction

Under this project, teaching and learning materials for Vocational Education and Training (VET) has been developed to enable smart farming practices in the Asian partner countries. In Task 3.1, as an attempt to develop quality certification for smart farm trainers, we have analysed the state of art of certification framework. In this task, we will look to quality assurance process for VET program in Asian and EU partners. *Quality assurance may be understood as the composite measures established to verify that processes and procedures are in place, which, when effective, ensure the quality and quality improvement of VET. The measures often have a regulatory or legislative underpinning and status* [1]*.*

The aim of this task is to provide assurance that the training program meets the quality standards of the profession for which this program prepares. This process offers a multitude of benefits, from the improved and performance of the designed programs, to the trust of the partners and the heightened motivation.

This task has been further divided into subtasks as follows:
- T3.2.1: Look to quality assurance process for VET program in partner countries
- T3.2.2: Learn from the first round and identify the gaps.
- T3.2.3: Propose the quality process implemented in T2.1

In the following section we will be briefly analysing the scenario of quality assurance practices in Asian partner countries considering the following aspects.
- Governments' policies and framework for VET accreditation in partner countries
- Accrediting bodies (for VET) in partner countries
- Process of accreditation
- Possibility of authorizing our training courses.
- Recommendations for particular partner country

2   Quality assurance process for VET program in partner countries

This section illustrates task T3.2.1. The aim of this section is to analyse the quality assurance process for VET program in Asia and EU.

2.1   Thailand

2.1.1   Governments' policies and framework for VET accreditation

A Thailand NQF was developed and approved by the Cabinet in January 2013, and the Cabinet approved its implementation in November 2014 [2]. The NQF covers all of the education sectors (secondary education, TVET, higher education, etc.), as well as skills standards qualifications, and professional qualifications.

The NQF/framework structure includes nine levels of qualifications, which are based on increasing complexity of learning outcomes and involve knowledge, skills, and attributes at

every level. There are three parts: (a) qualifications components and levels, (b) connecting and benchmarking mechanism, and (c) learning outcomes per educational qualification level.

Qualifications have not been unitized/modularized, but there are plans to do so in the future.

The Office of the Education Council (OEC) is responsible for providing national information, coordinating, managing and monitoring the NQF. Implementing agencies, i.e., the Ministry of Education, and the Ministry of Labour are responsible for assessing and recognizing qualifications from other economies. The NQF and its implementation plan were approved by the Cabinet of Thailand.

Sector qualifications are also in place for TVET and professional qualifications.

2.1.2 Accrediting bodies for VET

There are 3 key bodies responsible for quality assurance of TVET in Thailand [2]:
- Office of the Vocational Education (OVEC) (Ministry of Education)
- Department of Skills Development (Ministry of Labour)
- Thailand Professional Qualifications Institute, TPQI

2.1.3 Process for accreditation of qualifications

TPQI awards professional qualifications to individuals and accredits professional qualifications and occupational standards. The TPQI is a public organization under the supervision of the Prime Minister, established by Royal Decree in 2011. TPQI is responsible for developing the national professional qualifications system, including the professional qualifications framework, supporting industry in developing occupational standards, registering and monitoring organizations responsible for assessing individuals' competencies in accordance with developed occupational standards. TPQI supports industrial and business sectors in developing the occupational standards to meet their needs and demands.

Accreditation processes are legislated through the role of the TPQI rather than specific legislation related to accreditation. Through the Royal Decree, TPQI can prescribe guidelines, goals and policies on administering the affairs of the Institute. Requirements of the TPQI are detailed in the Royal Decree.

Through the support of TPQI, occupational standards and qualifications are developed by the industrial and business sectors, agreed to and signed off on by senior representatives of the industry and business sectors and responsible government agencies, tabled at the TPQI's Board of management meetings and announced in the Royal Gazettes by the Institute.

ISO 17024 has been used as a platform for ensuring quality in assessing individuals' competencies and awarding professional qualifications. The qualifications are designed at a national level to meet the requirements of the Thailand Professional

Qualifications Framework. Qualifications (and units of competency) accredited will be listed in Royal Gazettes and on the TPQI website.

TPQI is responsible for managing and monitoring the accreditation process given its remit under the Royal Decree. The Bureau of Accreditation and Auditing (a bureau within TPQI) is in charge of management and monitoring the accreditation process.

We need to apply in the TPQI system and complete the application (see Figure 1). After that, we need to fill all required information and upload on the website (see Figure 2). Then, they will check all the information and related documents.

2.1.4 Possibility of authorizing training course

It is possible to authorize our training courses with TPQI on a smart farming training course.

2.1.5 Recommendation from CMU

CMU is able to provide short course certification for smart farmer training and non-degree programs which can apply the knowledge further to master degree.

2.2 Bhutan

2.2.1 Governments' policies and framework for VET accreditation

Bhutanese Government has identified Technical and Vocational Education and Training (TVET) as an essential element to give students access to high quality, alternative pathways in education that would correspond with their learning aptitude and to meet the demands of the industrial sector. Making TVET available will enhance the students' employment prospects and address the national demand for skilled manpower (MoE, 2017). Therefore, the Ministry of Education has embarked on the creation of an alternative pathway to education by initiating TVET education programmes in mainstream schools, from Primary through to Class XII. This shows that Bhutan is preparing to promote VET for its development. Bhutanese Government has a framework developed for long-term training course (refer Fig 1) but not for any short-term training courses.
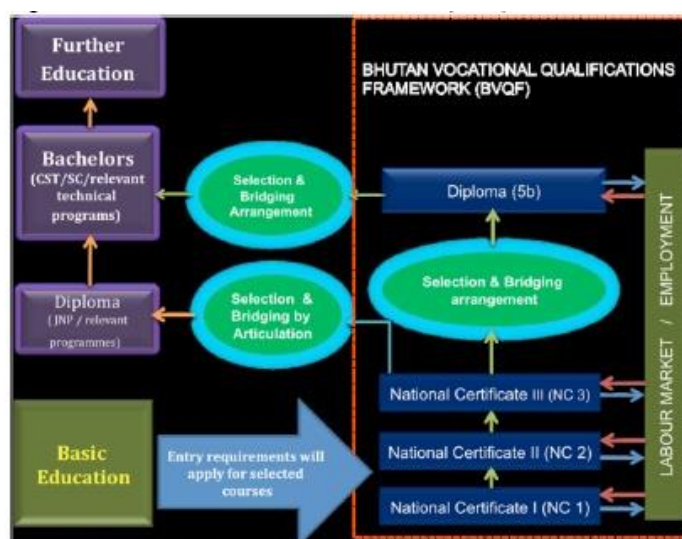
Figure 1 Bhutan Vocational Qualifications Framework (BVQF)

Source: MoLHR, 2006; Lhazom, n.d., p.34

Table 2 The Bhutan Qualifications Framework

Source BAC, 2012

BQF Level	School Education	Vocational Education	University Education	Monastic Education
8			Doctorate	Khenpo
7			Master's Degree	Geshey
6			Bachelor's Degree	Tenchoe
5		ND1 and ND2	Diploma	Madhyamik
4	BHSEC	NC2 and NC3		
3	BCSE	NC1		
2	LSE			
1	PE			

PE= Primary Education; LSE= Lower Secondary Education; BCSE = Bhutan Certificate for Secondary Education; BHSEC= Bhutan Higher Secondary Education Certificate; NC= National Certificate; ND= National Diploma

Source: BAC, 2012.

2.2.2 Accrediting bodies for VET

There are two quality assurance bodies in Bhutan;

- Bhutan Qualification Framework, which is a quality assurance body for tertiary education system, the technical and vocational education and training (diploma and certificate, and the school system [3].
- Bhutan Accreditation Council [4] is an autonomous body having overall authority on accreditation, quality assurance, and interpreting and recognizing the qualifications that will ensure an international level of tertiary education standards.

2.2.3 Process for accreditation of qualifications

The training under SUNSpACe is a project based short-term training. There does not exist any accrediting body for such short-term training/courses. There is no existing government policies and framework for short-term training. VET program in Bhutan is considered as a long-term training program. So, there is no possibility of authorizing our training course from a government body.

2.2.4 Recommendation from RUB

However, the quality assurance of the short-term training under the sunspace project be conducted by the college through College Academic Committee (CAC) and hence can be approved by this committee based in College of Natural Resources.

2.3 Nepal

2.3.1 Governments' policies and framework for VET accreditation

In Nepal, Total Quality Management for TVET [5] Institutions and programmes has been implemented. This programme seeks to enhance quality through staff development programmes, designing learner-centered programmes and improving planning in TVET institutions. At higher education level, a Quality Assurance and Accreditation Council (QAAC)

has been established and works in collaboration with universities and other tertiary institutions to improve the quality of higher education including tertiary TVET. The TVET Policy of 2012 foresees the development of a revamped Nepal Vocational Qualifications system managed by the National Skills Testing Board. All modes and places of learning, formal or informal, in-school or on-the-job will be recognized in such a system and can be used for progression and transition. The Skills for Development Programme (SDP), launched in July 2013, aims to develop the National Vocational Qualifications Framework (NVQF).

The TVET structure in Nepal comprises formal, informal, and non-formal education. In terms of organized provision through a technical school system, the Nepali TVET system is about 30 years old. Students enter the formal TVET program at a technical school after completing grade 10 of general school education. The formal TVET system in Nepal includes: (i) vocational training (3–6 months of training courses for youths age 16 years and older); (ii) a technical SLC program (15 months to SLC pass and 29 months to grade 10 pass students); and (iii) diploma and technical certificate programs (additional 3 years following grade 10 completion or SLC pass).

2.3.2 Accrediting bodies for VET

There is a national autonomous body committed to the development of human resources for Nepal. This is "Council for Technical Education and Vocational Training (CTEVT)". Major functions of the CTEVT include policy and program formulation, coordination and facilitation, quality control, and program implementation. Under CTEVT, there is "National Skill Testing Board". This board is responsible to develop **National Occupational Skill Standards** and conduct tests based on the **occupational skill standard** and certify them. This certificate is recognized by Government, semi-government and private sectors too.

The standards are developed by the team of experts and this standard has to be approved by NSTB. The team of experts is formed by NSTB.

2.3.3 Process for accreditation of qualifications

We have to submit our training course to NSTB for its approval. If there is already the course or skill standard developed similar to our course, then they might ask us to slightly modify. If not, then there is high possibility of getting approval for our course.

2.3.4 Possibility of authorizing training course

In Nepalese context, we see possibility in getting approval of our course and inter into certification process.

2.3.5 Recommendation from KEC/AEC

Accreditation of short-term training under the SUNSpACe project can be conducted by our institution under the name of the project. We have been practicing such certification for all supplementary trainings provided to our students.

3   Accrediting training course globally

The aim of this section is to find if our training course can be accredited globally. We have identified CPD Certification Service UK as one of the organisations through which we can accredit our training course.

3.1   CPD Certification Service UK

The CPD Certification Service was established in 1996 as the leading independent CPD accreditation institution operating across industry sectors to complement the Continuing Professional Development policies of professional institutes and academic bodies. The CPD Certification Service provides support, advice and recognized independent CPD accreditation compatible with global CPD principles. This body appraises the educational programs according to the highest standards and their accreditation is a symbol of quality and credibility. They have also developed a universal checklist that is impartial or non-biased and is also objective. It lays out strict guidelines that have to be met (no exceptions) in order for a program to receive the accreditation. CPD is committed to enhancing the personal skills along with the professional skills in a range of career paths.

3.2   Process of gaining accreditation for training courses from CPD

Many organizations from an extensive range of industry sectors are able to benefit from CPD accreditation for training courses, workshops and educational events. The CPD Service has a substantial portfolio of accredited CPD providers that can help learners achieve their individual Continuing Professional Development obligations. Gaining accreditation for training courses helps organisations formalise their knowledge into a recognised approach to learning. This section explains the course accreditation process and how to get a training course accredited.

The first phase of the course accreditation process is to have an informal consultation to ensure training courses and events are suitable for Continuing Professional Development. CPD Consultants will discuss the structure of the training, how it is delivered, find out more about the groups of expected attendees, and finally the key objectives for CPD accreditation. At this phase, the team will recommend the most suitable steps to become an approved CPD provider.

The CPD course accreditation process follows an intentionally practical method that has been continuously developed over the past few decades. The course accreditation process is focused on providing the highest standards of structured Continuing Professional Development learning for delegates and attendees.

Once approved as an accredited CPD provider, the next step is to submit training courses directly to the Assessments team to start the accreditation process. The training course materials required for review typically include presentation slides, handouts and any additional training course notes.

The CPD Assessments team will evaluate the materials, review the structure and provide advice to help develop the training courses where required. This process is to ensure the training courses are educational in content, structured coherently, with clear learning objectives and outcomes.

Each CPD training course is benchmarked against a proven assessment criteria to ensure the required standards are met across a number of key areas. Should training courses not meet the accreditation standards to be approved, the Assessments team will provide detailed feedback to help improve the training courses. The accreditation process takes 10-14 working days, depending on the size and duration of the training course.

Upon successful completion of the accreditation process, we will receive a 'CPD Certified' certificate of achievement, demonstrating the training course meets the required standards, knowledge and guidelines. The 'CPD Certified' symbol can then be used on the accredited training course materials, as well as the delegate certificates of attendance.

3.3 Benefits of CPD accreditation for training courses

➢ Provides increased appeal to our project proposition and
➢ Provides an endorsement for our project and also affords a greater profile recognition and credibility, improved quality of our training

CPD claims that the accreditation process is fast, detailed and invaluable as we drive our organisations Continuing Professional Development objectives forward.

4   Gaps identified from the first pilot training

This section illustrates task T3.2.2. The aim of this section is to highlight the learnings from the first pilot training organized at Chiang Mai, Thailand in 25-26 February 2020. We will identify the gaps of the training session, so that we can mitigate those in upcoming sessions.

In the first pilot training, 22 individuals including 10 farmers, 7 researchers and officers and 5 students participated in the first pilot training organized at Chiang Mai Thailand on 25-26 February. The report of the training is attached in Annex A.

According to the results, respondents are satisfied with this first round training in all aspects. However, there are six main issues concerned that got the score lower than 3.70. The satisfaction survey conducted for this purpose is also included in the document in Annex A.

1. The consistency of training topics with the purpose of the training:
   ● Should have an example linked to agriculture or Smart Farming in all topics
   ● The training should be more practical.
   ● Should have real cases or sample farms of the use of smart farming technologies and tools that can be adopted in farms.

- The sample farm should be the place were using technology in order to make trainees easily understand and apply

2. Time of training:
   - Should have more time for training because the content is wide.

3. The training contents appropriation:
   - Should be more detailed.
   - Should give the training documents to participants.
   - Should be in local language.
   - Should be more relevant to agricultural production.

4. The benefit from the training for smart farming adaptation in farm:
   - Should have equipment relevant to smart farming (smart sensors, tools, etc.) for demonstration to trainees/participants.

5. Whether the knowledge and skills that farmers received will be applied in agricultural production:
   - In terms of using tools or smart technologies, the training should train step by step.
   - The training should have more examples linked to agriculture that will help farmers get more understanding.

6. Training duration consistent with the course content:
   - Should be more duration in each session due to lots of details in each topic
   - Farmers require more time to understand each topic.

5   Proposed quality process for partner countries

This section illustrates task T3.2.3. We propose four different level of accreditation for the training modules of SUNSpACe in the partner countries.

1. Institutional Accreditation (after project period)
2. Consortium Accreditation (within the project period)
3. Accreditation from Government body
4. Other

Table 3 below shows the proposed Quality process for the partner countries.

Table 3 Proposed Quality Process for Partner Countries

SN	Particulars	Nepal (AEC/KEC)	Thailand (CMU/KKU)	Bhutan (RUB)	Type of Training	Remarks
1	Institutional Accreditation	Certificates provided by AEC/KEC	Certificates provided by CMU/KKU	Certificates provided by College Academic Committee and	➢ Online ➢ Online and Smart Lab Visit	

	(After project period)			approve by College of Natural Resources	➢ Smart Lab visit Training Module	
2	Consortium Accreditation (Within the project period)	Certificates provided by AEC/KEC and consortium	Certificates provided by CMU/KKU and consortium	Certificates provided by RUB and consortium	➢ Online ➢ Online and Smart Lab Visit ➢ Smart Lab visit Training Module	
3	Accreditation from a Government body	Accreditation of training course from Krishi Gyan Kendra and/or CTEVT Certifying trainees from NSTB Recognizing training from other government organizations	Accreditation of training course from TPQI		➢ Smart Lab visit Training Module	
4	Others	Recognizing training from local professional bodies	Recognizing training from local professional bodies	Recognizing training from local professional bodies	➢ Smart Lab visit Training Module	
		➢ Recognizing training from international agencies			➢ Smart Lab visit Training Module	

5.1 Institutional Accreditation

In case of Bhutan, RUB will apply the training course for approval to the College Academic Committee (CAC) under College of Natural Resources. After approval, the partner RUB will run the training and certificates to the participants will be provided by the institution.

In case of Nepal, KEC and AEC will apply the training course for approval to the College Management Committee. After approval, the KEC and AEC will run the training and certificates to the participants will be provided by the institution.

In case of Thailand, CMU and KKU will apply the training course for approval to the University. After approval, these institutes will run the training and provide certificates to the participants upon completion of training.

5.2 Consortium Accreditation

Within the project period, all the training undertaken by all participants will be recognized by the project consortium. A joint certificate will be provided from the consortium and the partner institution.

5.3   Accreditation from Government body

In the following section we propose how partner institute can accredit the SUNSpACe training course from a government body in their country.

5.3.1   Nepal

Our training course in Nepal will be recognized by a government organization named Krishi Gyan Kendra. The role of Krishi Gyan Kendra as a knowledge resource center is very important to expand commercial agriculture in Nepal. This organization aims to support to decelerate imports and accelerate exports by enabling qualitative production competitively with maximum benefit. It allows local-level research, where excellent research findings can be tested and transferred to farmers. Krishi Gyan Kendra within the District Agriculture Development Office is in 50 plus districts of Nepal. The centers connect researchers and farmers. They conduct field research and demonstrate new technology on their farms, provide an open laboratory to farmers, transfer technology by providing regular training to youths and farmers, and train agriculture extension workers based in the local units.

This center can endorse our training and certification by allowing us to use its logo in our certificates and training banner in Nepal. For this we need to write a formal application with the details of training materials and probable date of trainings in Nepal. Looking at the importance of the training, the center may appoint a government officer to look upon the SUNSpACe training.

https://kathmandupost.com/16/2019/12/13/bringing-new-technology-to-nepali-farmers

National Skill Testing Board (NSTB) under CTEVT in Nepal is responsible for skill testing of trainees trained by training providers. The skill testing process is mentioned below:
1. Classification of Occupation
2. Develop/ revise Occupational Skill Standard
3. Develop/revise Test Item
4. Advertise for Skill Test
5. Collect and verify Skill Test Application
6. Fix Date and Venue for Skill Test
7. Arrange tools, equipment and materials for Skill Test
8. Conduct Skill Test
9. Distribute certificate to the successful candidates

In our SUNSpACe scenario, the trainee trained by our project need to work in the smart farm for at least one year to be eligible for certification from NSTB. In this case the approved examination material (need to have prior approval from NSTB and incudes both practical and theoretical assessments) of SUNSpACe will be used by NSTB to test the skill of our trained farmers.

Table 4 Skill Test Requirement in Nepal

Skill Level	Requirements
Elementary	Successful completion of 140 hours vocational training in relevant occupation/trade
Level – 1	Literate with knowledge and skill in the relevant occupation with minimum of one year work experience in a related occupation/trade. Successful completion of one month (160 hours) vocational training in relevant occupation/trade Vocational training with six months' work experience in the relevant occupation/trade.
Level – 2	Literate with knowledge and skill in the relevant occupation with minimum of three years' work experience in a relevant occupation/trade. One year training (min 600 hr theory and 800 hr practical) in relevant occupation/trade. One year's work experience after the level-1 ST certificate passed in relevant occupation/trade.
Level – 3	Literate with knowledge and skill in the relevant occupation with minimum of five years' work experience in a relevant occupation/trade. Two years' work experience after one year training in a relevant occupation/trade. One year's work experience after skill level-2 certificate passed in relevant occupation/trade.
Level – 4	Ophthalmic Assistant, Level-3 passed with three-year experience and one year training. Certificate level in Health Science (Ophthalmology) equivalent passed with three years' experience and one year training.
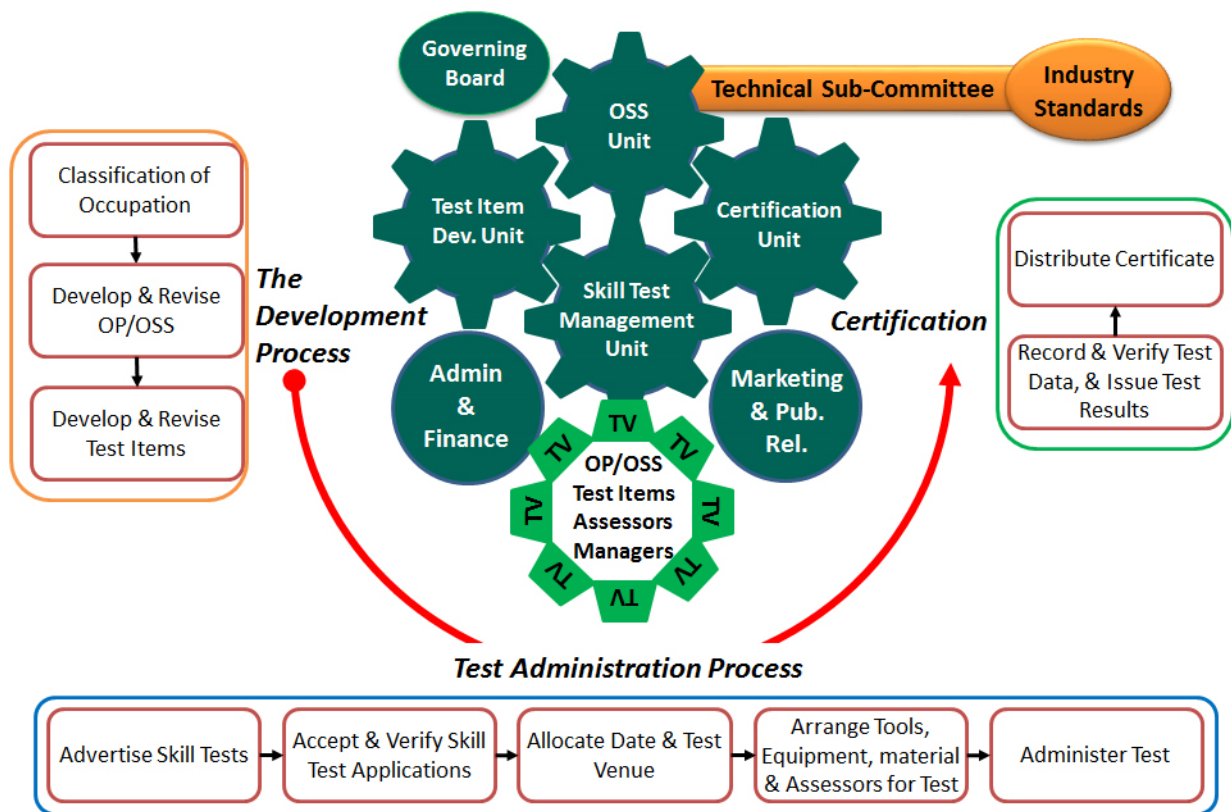
Figure 2 Skill Testing Process (Nepal)
(Diagram and information taken from nstb.org.np)

5.3.2 Thailand

In case of Thailand accreditation of training course from TPQI is possible. CMU and KKU need to apply the training course at TPQI for approval. The process of application is online. Fig 3 shows the sign-up system of TPQI. Fig. 4 is the application form for the TPQI approval.

Actually, the TPQI has a smart farmer training course with competency 4-6 levels.

 Level 4 is people who are able to develop, plan agricultural product preparation processes systematically and develop complex production processes to meet complex standards.

 Level 5   is people who are able to manage complex value-added processes for agricultural production by planning to increase the value of agricultural products proceed to increase the value of agricultural products and clearly define marketing objectives, operations, and achievement.

Level 6 is people who are able to perform complex tasks in post farming agricultural production management also plan the development of agricultural production processes and develop production processes with accordance crop standards. preserving agricultural products and transporting agricultural products as well as being able to develop new knowledge from previous by extending the knowledge.

Reference: http://tpqi-net.tpqi.go.th/home/Occ/group/AGRICULTURE
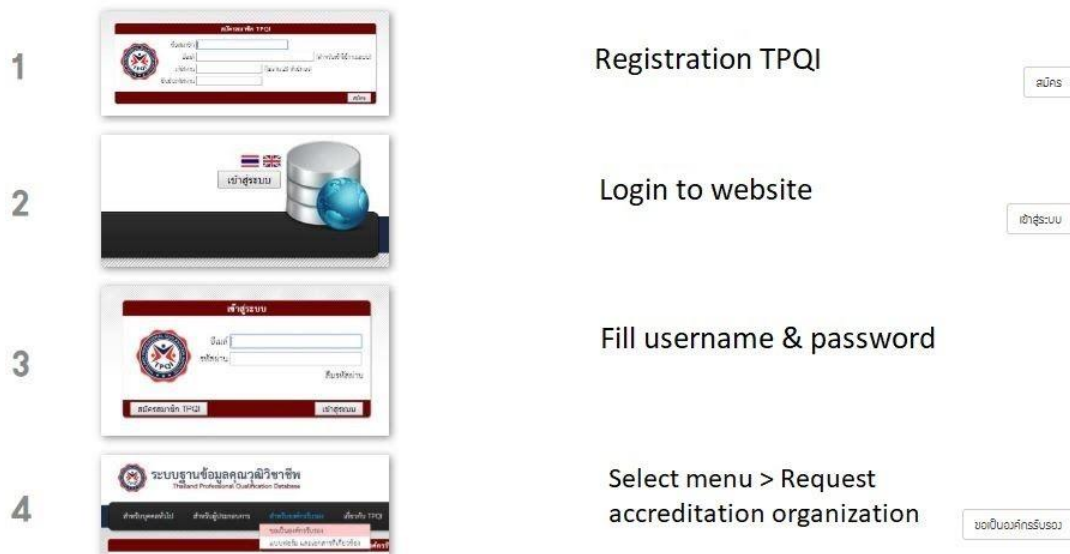
Figure 3 Sign-up System for TPQI

Figure 4 Application Form in the TPQI Website

5.3.3   Bhutan

Institutional accreditation by the University seems to be the only option in case of Bhutan.

5.4   Others

Partners institutions will look for any possibility to recognize SUNSpACe training course from any professional bodies with in the country.

6   Workflow of SUNSpACe Training

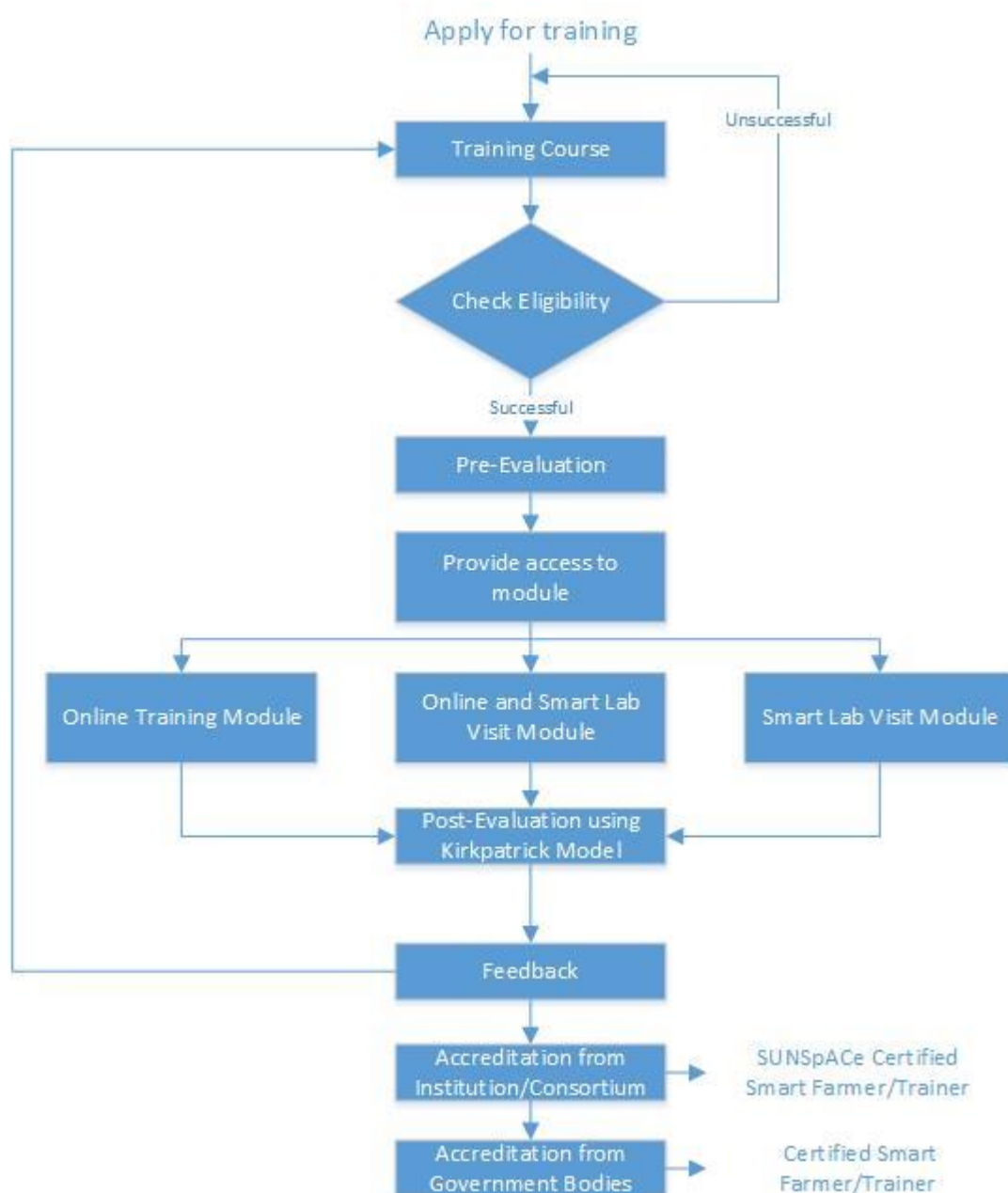Fig. 5 represents the workflow of SUNSpACe training process.

Figure 5 Workflow diagram of SUNSpACe Training

Initially when the participants apply for the training, the partner institution checks the eligibility of the participant and assign the requested module of the training course.

We evaluate the participants understanding before the training.

The post evaluation of the training is done by Kirk Patrick Model. This model enables us to know how effective the training has been. It allows us to make sure that our training programs are relevant, engaging and effective. It ensures whether we are putting the learning of smart farmers in practice. This model is further illustrated in a next deliverable D3.3.

For the participants feedback, we have proposed a satisfaction survey after the training which ensures how we have met the objectives of the training. The sample of the satisfaction survey is attached in Table 1 of Annex.

7   References

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Annex

SUNSpACe: First round Training Report

Training Date: 25 - 26 February 2020
Training Venue: G's Park, Chiang Mai, Thailand
Training Participants (Trainees): Total 22 persons
      Researchers and Officers: 7 persons
      Student (Computer Engineering): 5 persons
      Farmers: 10 persons
Training Topics:

      Due to the Corona Virus situation most of the project partners and smart farmers could not travel to join the first-round training in Chiang Mai province, Thailand. Therefore, we had to organize the first-round training by both online and offline training to train participants who can join the training in Chiang Mai province. The training topics are shown in Table 1.

Table 1: Training topics

Date	Topic	Trainer
25 February 2020	Cultivation Farming (Online Training)	Tashi (RUB)
	Livestock Farming (Online Training)	Kritapon (KKU)
	Digital Architecture Overview (Online Training)	(UWS)
	Smart Monitoring (Offline Training)	Paweena (CMU)
26 February 2020	Agricultural Standardization (Online Training)	(ULL)
	Decision Modelling (Online Training)	(UWS)
	Smart Farming Components (Offline Training)	Kalpana (AEC)
	Business Modeling (Online Training)	(ULL)

Satisfaction Report
   1. Satisfaction Survey
    Table 1: Satisfaction Survey

Satisfaction Survey

5 = Very Satisfaction, 4 = Satisfaction, 3 = Moderate Satisfaction, 2 = Low Satisfation, 1 = Very Low Satisfaction

Assessment Details	Score				
	5	4	3	2	1
Satisfaction of activities					
1. he consistency of training topics and the purpose of the training.	5	5	4	3	3
2. Time of training	5	5	3	3	4
3. The training contents appropriate	5	5	3	3	3
Satisfaction of experts					
1. Techniques of experts to present	5	4	2	3	3
2. Interrested and comepleted of contents	5	5	2	3	4
3. Presentation materials of experts	5	4	3	3	3
4. Time managment	5	5	4	3	4
Satisfaction of services					
1. Lecture hall	5	4	4	3	4
2. Audiovisual aids	5	5	4	3	4
3. Food and Beverage	5	4	3	3	4
4. Services / facilities of staffs	5	5	4	3	4
Satisfaction and advantages of training					
1. The benefit from the training to adaptation of smart farming in your farm.	5	5	3	3	3
2. The knowledge and skills that you received able to apply with your agricultural production.	5	5	4	3	3
3. You are satisfied that you participated in the activities	5	5	4	3	3
4. Training duration consistent with the course content	5	5	3	3	3
Suggestion					
....					
....					
....					
....					
....					

Table 1 illustrates the satisfaction survey that was used to ask respondents who participated in the first round training. This survey includes four main aspects. Satisfaction of activities aspect aims to assess the satisfaction of participants in terms of an appropriate time and content of training. Satisfaction of experts (trainers) aspect aims to assess the satisfaction of participants in terms of teaching techniques and materials, the interest of content, and time management of trainers during training sessions. Satisfaction of services aspect aims to assess the satisfaction of participants in terms of location and services during training day. And Satisfaction and advantages of the training aspect aims to assess the satisfaction of participants in terms of advantages of this training, the plan of applying the knowledge from the training in their farm in the future. And the last part is a suggestion that respondents can give some suggestions to the organizer to enhance the next training.

2. *Analysis Methodology*

The satisfaction questionnaire was answered by our participants who attended the first-round training in Chiang Mai, Thailand during 25-26 February 2020. The total of respondents is 16 persons. The process to analyse this questionnaire is illustrated in Figure 1.
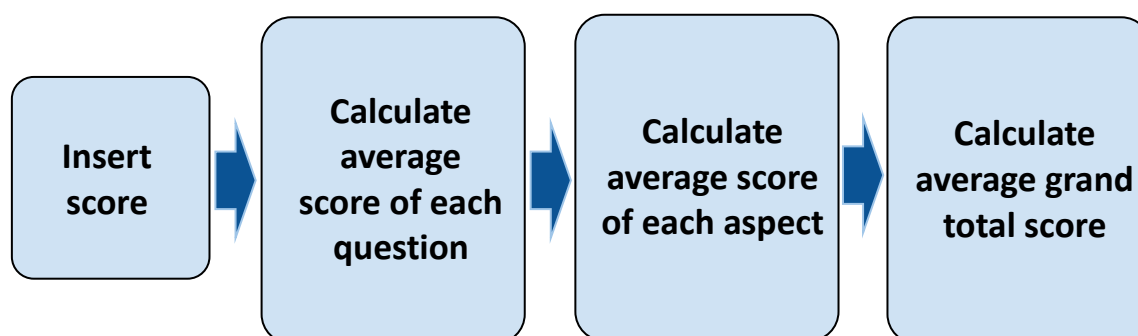
Figure 1: Flow of questionnaire analyzation

Figure 1 shows the flow of questionnaire analyzation methodology. The first step, scores of each question answered by respondents were inserted into the excel table. Then, the average scores of each question were calculated by using the average formula in the excel sheet. After that, the average scores of each aspect were calculated by using the average formula in the excel sheet as well. Finally, the average grand total score of this questionnaire was calculated by using the average formula in the excel sheet.

3. Result

Table 2: Participant's satisfaction results

Assessment Details	Average
Satisfaction of activities	
1. The consistency of training topics and the purpose of the training.	3.69
2. Time of training	3.63
3. The training contents appropriation	3.56
Total	3.63
Satisfaction of experts	
1. Techniques of experts to present	3.81
2. Interrested and comepleted of contents	3.75
3. Presentation materials of experts	3.81
4. Time managment	4.00
Total	3.84
Satisfaction of services	
1. Lecture hall	4.44
2. Audiovisual aids	4.19
3. Food and Beverage	4.19
4. Services / facilities of staffs	4.31
Total	4.28
Satisfaction and advantages of training	
1. The benefit from the training for smart farming adaptation in your farm.	3.50
2. The knowledge and skills that you received are able to apply with your agricultural production.	3.63
3. You are satisfied that you participated in the activities	4.00
4. Training duration consistent with the course content	3.63
Total	3.69
Grand total	3.88

Table 2 shows the participant's satisfaction results of the first-round training in Chiang Mai, Thailand, during 25-26 February 2020. The full score of each question is five points.

According to the results, respondents are satisfied with this first round training in all aspects. However, there are six main issues concerned that got the score lower than 3.70.

1. The consistency of training topics with the purpose of the training:
   - Should have an example linked to agriculture or Smart Farming in all topics
   - The training should be more practical.
   - Should have real cases or sample farms of the use of smart farming technologies and tools that can be adopted in farms.
   - The sample farm should be the place were using technology in order to make trainees easily understand and apply

2. Time of training:
   - Should have more time for training because there is lots of knowledge and topics.

3. The training contents appropriation:
   - Should be more detailed.
   - Should give the training documents to participants.
   - Should be in Thai.
   - Should be more relevant to agricultural production.

4. The benefit from the training for smart farming adaptation in your farm:
   - Should have equipment relevant to smart farming (smart sensors, tools, etc.) for demonstration to trainees/participants.

5. The knowledge and skills that you received are able to apply with your agricultural production:
   - In terms of using tools or smart technologies, the training should train step by step.
   - The training should have more examples linked to agriculture that will help farmers get more understanding.

6. Training duration consistent with the course content:
   - Should be more duration in each session due to lots of details in each topic
   - Farmers require more time to understand each topic.

Knowledge Assessment Report

   1. Knowledge Assessment form

Assessment worksheet
Smart Monitoring

1. What technology can be used to monitor air temperature? a.) Internet of Things (IoTs) b.) Soil sensors c.) Weather station d.) All of above	**2. What kind of smart device can be used to detect the value of humidity?** a.) Computer b.) Weather station c.) Thermometer d.) None of above
3. What kind of smart sensor can be used to monitor CO2 concentrations? a.) Air temperature sensor b.) Moisture sensor c.) Gas sensor d.) PH sensor	**4. What kind of smart device can be used to detect the value of air pressure?** a.) Computer b.) Weather station c.) Thermometer d.) None of above
5. What kind of device can be used to measure rainfall? a.) Gas sensor b.) Temperature sensor c.) Rain Gauge d.) Humidity sensor	**6. Which one is incorrect about the effect of acid rain on crops?** a.) Leeches toxins from soil, Poisoning crops b.) Acid rain creates brown spots in leaves, impeding photosynthesis c.) Acid rain directly increase the chlorophyll content of leaves d.) Allows organisms to infect through broken leaves
7. How to monitor acidity of rain? a.) Using PH meter b.) Using temperature meter c.) Using humidity meter d.) Observe color of rain water	**8. What does an anemometer do?** a.) Measure wind speed b.) Indicate wind direction c.) Indicate water flow d.) Measure wind speed and indicate wind direction
9. What does a wind vane do? a.) Measure wind speed b.) Indicate wind direction c.) Indicate water flow d.) Measure wind speed and indicate wind direction	**10. What does an aerovane do?** a.) Measure wind speed b.) Indicate wind direction c.) Indicate water flow d.) Measure wind speed and indicate wind direction
11. The greater the intensity of light, the rate of transpiration is .... a.) Same b.) Greater c.) Lower d.) None of above	**12. Which one is the impact of UV on crops?** a.) Leaf size b.) Leaf thickness c.) Crop growth d.) All of above
13. What does the weather station do? a.) Measure yields b.) Measure weed c.) Measure insect d.) Measure light intensity	**14. What does Gravimetric do?** a.) Measure mass soil potential b.) Measure mass water potential c.) Measure mass water content d.) Measure mass soil content
15. What is an advantage of Neutron scattering (attenuation)? a.) Samples a relatively large soil sphere b.) Repeatedly sample same site and several depths c.) Accurate d.) All of above	**16. What kind of sensor used to collect soil temperature?** a.) Gas sensor b.) Soil moisture sensor c.) Rain gauge d.) Wind Vane
17. What does soil moisture sensor do? a.) To monitor soil texture b.) To monitor soil type c.) To monitor soil moisture d.) To monitor soil structure	**18. What is the communication media used to send soil moisture data to Cloud server?** a.) 3G b.) WiFi c.) GPRS d.) All of above
19. What sensor device can be used to monitor PH in soil? a.) Weather station b.) Air sensor c.) Soil PH sensor d.) Water sensor	**20. What does soil sensor do?** a.) Measure soil temperature b.) Measure soil moisture c.) Measure soil electrical conductivity d.) All of above

     This assessment is an example assessment that we tried to test the participants' understanding after training. The topic of this assessment is Smart Monitoring. The questions in this assessment are relevant to the content of smart

monitoring training comparing twenty questions. The questions relevant to the general definitions of smart farming devices, functions of them, and some relationship among parameters and crops.

2. Result

The 19 participants did the assessment. The result of an assessment is shown in the graph (see Figure 2).
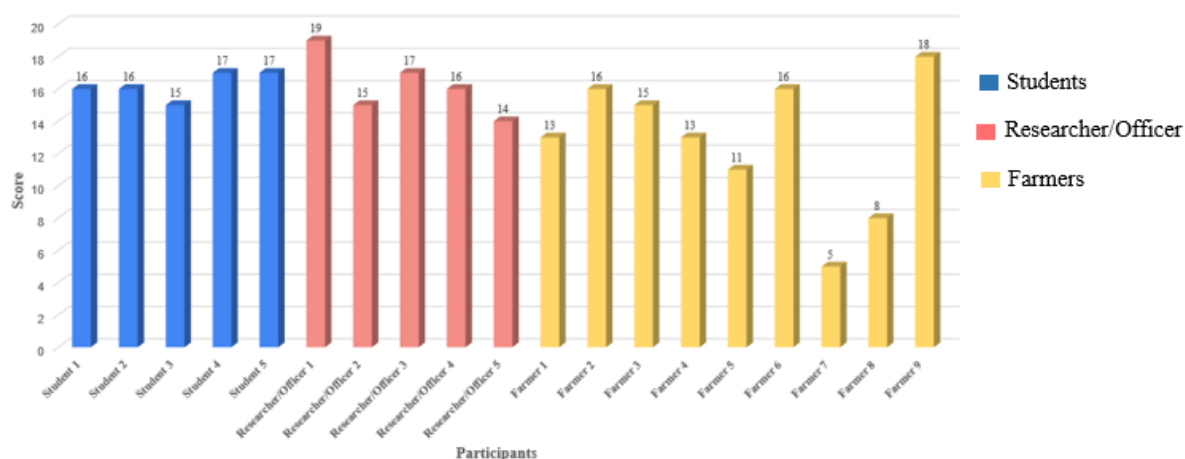
Figure 2: Knowledge Assessment result

Table 3: Percentage result of each group

	Total	Student	Researcher/Officer	Farmer
No. of respondents	19 persons	5 persons	5 persons	9 persons
Max	19	17	19	16
Min	5	15	14	5
Mean	14.58			
Over Mean	70.59%	100%	80%	44.44%
Below Mean	29.41%	0%	20%	56.56%

Figure 2 illustrates the result of assessment that participants did it after the training was finished. The total score is 20 points. According to the graph, It was classified into three groups by color; the blue color is student, the orange color is researchers/officers, and the yellow color is farmers. Based on the result, the maximum score is 19 points and the minimum score is 5 points that means, the median or mean score is 14.58 points as shown in Table 3. According to the results, we can see that most students and researchers/officers got scores higher than the mean score as shown in Figure 2 that equal to 100% and 80% respectively (see Table 3). That means, most of them understand the contents of the training.

On the other hand, most farmers got scores lower than the mean score as shown in Figure 2 that equal to 44.44% (see Table 3). That means, farmers may not understand some part of the contents of the training. Consequently, we may need to revise the content to fit with their expectation and background.