



Erasmus+

Cooperation for innovation and the exchange of good practices sub-programme

FINAL REPORT form

Programme	Erasmus+
Sub-Programme	Cooperation for innovation and the exchange of good practices
Action	Capacity Building in higher education
Sub-Action	Joint Projects
Call for Proposal	EAC-A03-2016
Project number	585924-EPP-1-2017-1-TH-EPPKA2-CBHE-JP
Agreement/decision number	20180028
Project Title	Curriculum Development for Sustainable Seafood and Nutrition Security

Contractual Data

Dates and Beneficiaries

Dates

Project Start: 15/10/2017	Project End: 14/10/2021
Activities Start:	Activities End:
Project Duration(months): 48	

Beneficiary Data

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Co-Beneficiary / Partner	984820340	GADJAH MADA UNIVERSITY	Indonesia
Co-Beneficiary / Partner	948332723	INSTITUT PERTANIAN BOGOR	Indonesia
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Co-Beneficiary / Partner	998039209	CAN THO UNIVERSITY	Vietnam
Co-Beneficiary / Partner	999977851	NORGES TEKNISK-NATURVITENSKAPELIGE UNIVERSITET NTNU	Norway
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Project Summary and Horizontal Issues

Project Description

English - 1	<p>Seafood is nutritious, delicious and probably the healthiest among the food items. Its demand is rapidly increasing in each country and globally as more people are becoming aware of the health and thus are shifting their food habits from red meat to white meat and then to seafood. Therefore, seafood sector has been increasingly important for food security, nutrition, income and employment. Annually 96 million tons of seafood is caught from the oceans and the natural water bodies while 82 million ton is produced from aquaculture (FAO data). Fish catch from the wild is declining due to overfishing. Aquaculture is rapidly expanding with the technological advancement often creating environmental problems causing frequent collapses of some aquaculture systems e.g. shrimp farming. Therefore, seafood insecurity has been a global issue urging the need to ensure long-term sustainability.</p> <p>Recognizing the key role of higher education in shaping the industry, a project entitled, “Curriculum development project for Sustainable Seafood and Nutrition Security (SSNS)” co-funded by EU Erasmus+ programme, was launched in Oct 2017. The main objectives of the programme were to identify the problems and missing gaps in the existing fisheries curricula in higher education institutions in Indonesia, Thailand and Vietnam, and improve the curricula by developing specialized courses in changing context. Other objectives were to establish specialized SSNS centres and offer vocational training courses and internship programs so that the industry could get new dimension and better understanding. The project engaged over 60 lecturers from Asia and over 15 from Europe. A total of 57 MSc courses (target was 20, nearly 3 times more) have been either newly developed or improved from existing ones. Amongst them, more than 75% have already been accredited, incorporated into the curricula and offered to over 200 students (target 90).</p> <p>Typical new courses include Seafood and Human Nutrition, Seafood and Sustainable Development Goals, Seafood safety, Fish Quality and Traceability, Smart and Environmentally Friendly Aquaculture, Innovations in Fish Product Development among others. All the nine Asian partners established a new SSNS centre each or revived or strengthened the one which had earlier. Six of them have established new ones each and three of them strengthen their existing centres to contribute to the project objectives. More than 63 vocational training courses have also been developed, and nearly half of them were already offered during the project period to update the knowledge and also provide specific skills to over 600 professionals. The project also developed 48 Internship programs (target 45) to offer higher education degree students so that they could get exposure to the industry and get hands-on work experience. However, due to COVID-19, it was not possible to offer, although two partners managed to offer somehow, even though the project was extended for 12 months ended by Oct 14, 2021.</p> <p>The project organized two study trips to Europe; Norway and UK during which about 50 lecturers visited the renowned universities of Europe and learn how the courses are delivered. They also visited salmon farms and processing plants. They have learned how the courses are delivered and are encouraged to do more. Due to COVID19, program for Indonesia was organized online. A final conference was organized to review the outcomes and disseminate the outcomes of the project. Overall, the project team considers it very successful.</p>
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Horizontal Issues

Previous recommendations/follow-up

We would like to thank the evaluators for pointing out some weaknesses and providing the suggestions. Our responses are as follows:

Relevance: To address the sustainability, we have counted nearly 90% courses were explicitly addressing the sustainability. Similarly, for employability we also counted the courses which are explicitly related to enhancing the employability. Our records show that 40% of the courses address employability and all the VET and internship programs directly related to enhancing the employability of the student and trainees.

Lab equipment purchase: was delayed and not done until the mid-term reporting time. After receiving the recommendation, we immediately proceeded to revise the list of equipment going through all the laboratories of the partner institutions, and assessed the need to find out the need and specifications of the equipment. The initial list submitted in the proposal was a common list as there was no time to go through all those procedures. After assessment, all the partners provided the list with expected prices in their official letters (<https://www.seafood-security.org/ssns-documents-outcome>). All the partners' lists were forwarded to the EU Officer. They were approved and partners started purchasing them. Due to COVID-19 some partners (e.g. JFU, NLU) encountered some delay in delivery but most of others could manage before COVID19 or during.

Project design and implementation: Although, implementation of project was delayed and other activities such as quality assurance plan etc. we managed to catch up most for the activities. COVID19 situation occurred, and we expanded 12 months which helped us by giving more time to implement the project such as offer courses and organize activities as a result we could collect the data on no. of students, professionals trained, interns taking benefits and so on.

Accreditation issue: Partners focused mainly on developing the courses until the mid-term. After receiving the letter, the project coordinator took immediate action requesting the partners. Most partners indeed started incorporating the developed courses and provided the evidences of accreditation and offering of the courses. As a result, over 90% courses have been accredited/approved. The accreditation letters and courses incorporated in the programs and offered to the students are provided. The accreditation by an international bodies was not possible because there was no budget allocated for this project. Our opinion is that curricula/courses have been revised/developed and upgraded with the project support, partners will need to upgrade the remaining other courses, test them for few years (normally 5 yrs), then those curricula will be ready for international accreditation. That was the reason, project team consider that is beyond the scope of the current project.

Quality of cooperation: Decision making process has always been with the management board. Management board has been consulted via email or Zoom meeting if important decision has to be made such as fixing the dates for important events e.g. teachers trainings, final conference and so on.

Impact and dissemination: Project website: updated regularly after mid-semester reporting. Now it contains all the information.

Transversal issues

SUSTAINABILITY: Almost all the courses developed by SSNS explicitly or implicitly address the issue of sustainable aquaculture and fishery. Out of 57, 48 courses developed (i.e. 86%) are associated with the environment and saving life under water (Sustainable development goal, SDG#14 of UN). AIT alone has five courses, namely, cleaner aquaculture technology, sustainable seafood business, sustainable seafood and human nutrition, sustainable seafood and SDGs, explicitly address the sustainability. Similarly, MJU and KKU have fisheries technologies, fisheries innovation, aquatic feed and feed technology address the issue. In Indonesia, tropical aquatic bioresources, sustainable seafood and human nutrition, atmosphere-ocean ecosystem interaction, water quality and environmental system management, aquaculture production systems, capture fisheries modeling, sustainable smart aquaculture and so on. In Vietnam, environment and aquaculture, sustainable seafood and human nutrition, aquatic animal health and biosecurity, environmental impact assessment, fisheries resources management, aquatic animal ecophysiology etc. associated with the sustainability. Almost all the VET Courses address sustainability issue as they help produce more seafood using innovative ways to reduce the fishing pressure. Two-third (67%) i.e. 32 internship programs out of 48 are directly associated with sustainability. Most internship hosts are fish hatcheries which produce fingerlings to supply farmers so that farmers do not need to catch seed from the wild. Millions of fingerlings are still caught from the wild. Development and expansion of hatchery technologies replace wild seed. Therefore, internship programs serve the purpose of sustainability and students have opportunities to learn and contribute. More over, an internship host produces maggots in mass scale as an alternative to fishmeal because wild fish catch is unsustainable. Another internship host is with crab processing and wastes recycling. NLU has Mangrove ecotourism program.

EMPLOYABILITY: A total of 22 out 57 academic degree courses i.e nearly 40% courses directly address the employability. Whereas all the 63 VET courses are associated with employability as these courses provide skills of fish breeding, nursing, farming and producing food fish or fish fingerlings are the major competitive agricultural businesses in Asia. Similarly, partners who offer training on seafood processing (KKU) and product development (UGM) such as fish sausages, fish ball, crackers, fermented fish, etc. which are the items for businesses. Fish feed making offered by JFU & RIA1 could be an attractive business. Trainee participants use their training certificate enhances their employability. More importantly, internship programs link with the industry and enhance employability of students. All the 48 internship programs developed (100%) are associated directly with employability because all of them provide on-the job training. Some students may get job in the same company.

GENDER ISSUE: During inception workshop, 22 (i.e. 44%) were females out of 50 participated. Similarly, eight women out of 28 Asian lecturers for the trip to NTNU i.e. close to one-third, for the UK trip, exactly 50% women from Asia out of 28 had an opportunity. While European program countries, more women were involved than men during the workshop as trainers and organizers; eight were women out of 10 in NTNU and eight women out of 15 at Stirling. During the the teacher's training in Thailand and Vietnam. At least 15 MSc courses out of 57 (i.e. 26%) address the women's roles. All the VET courses are associated employability. Most of them are more suitable for women. About 10% of the internship programs are also directly related to the issue.

Involvement of people with fewer opportunities

Data were not collected explicitly for the reporting of project as there was no related objective; however, partners of course have their internal policies to give high priorities in providing scholarship for higher studies e.g. AIT provides high priority to girls students for scholarships, and has some quota for least developed countries. Similarly, all other partners universities (e.g. Vietnam) have even quota for students from each province especially from remote areas.

Refugees

There are no evidences that our project has supported any refuses. It was not in the plan either.

Least Developed Countries and regions

Each partner university have their own policies, rules and regulations regarding the student enrollments. Fisheries and aquaculture students are normally from poor families residing in remote areas where fisheries and aquaculture activities occur. They are often fishermen's or farmers sons/daughters who struggle for the education of their kids.

In Thailand, priority was given to the universities located in Northern (MJU) and north eastern regions (KKU) which are considered lagging far behind as compared to the central, eastern and southern regions. These partner universities are suffering from declining number of student enrollments as compared to Kasetsart University of Bangkok and Prince of Songkhla University of the South.

Some partner universities e.g. AIT and Can Tho University provide scholarships to study aquaculture or fisheries in their universities, especially from least developed countries such as Bangladesh, Cambodia, Laos, Myanmar, Nepal, and so on.

Partner universities such as AIT, RIA1, Can Tho University, etc. offer VET courses to professionals of different countries around the world including Africa Oceana, etc which are supported by some donors e.g USSEC (United States Soybean Export Council) supported a tilapia training offered by Aqua-Centre of AIT.

We also invited teachers from Bangladesh, Myanmar, Nepal and Pakistan to attend final conference. Over 15 lecturers from Myanmar attended the final conference to learn about the project. They hope to develop curricula for MSc degree in Yangon University, Yangon, which will lead university in Myanmar. Others will follow. The project team had developed a proposal to include those countries and partners in the new proposal as an expansion of the SSNS project to other countries. We hope to submit it in the coming call.

Innovation

Innovation is the main mission of SSNS partners especially in the areas of seafood production or supply (fishing technologies, aquaculture, biotechnology etc.), processing (food technology, product development etc.) and also feed. Therefore, almost all the MSc courses, trainings and internship activities are related to innovation such as development of new and cost effective technologies or products and their testing or applications. All the master's degree students need to conduct research to fulfill their requirements as a part of their degrees. The courses taught provide knowledge and guide them to identify the missing gap so that they can carry out thesis research. Among the new courses developed, innovation is reflected in several courses e.g. AIT has cleaner aquaculture technology and aquaculture nutrition and feed technology; MJU developed fisheries Innovation, fisheries product development, technologies in aquatic science, and KKU developed Aquatic animal feed technology and aquatic animal product processing. In Indonesia, UGM developed sustainable smart aquaculture, IPB developed a course on seafood enzymes and biomolecular research, and JFU developed aqua feed technology, innovation in fish product development and aquaculture production systems. CTU improved their courses such as environment and aquaculture, and research methodology, NLU improved existing courses such as applied biotechnology, advanced nutrition and feed technology, and applied statistics to help innovation. Similarly, RIA1 developed the courses to carry out innovations in the areas of feeds and feeding and marine fish breeding and nursing methods.

Almost all the VET courses developed have roots in innovation. They promote innovative technologies e.g. tilapia farming which to produce millions of monosex tilapia fingerlings using technology developed by AIT. It helps develop specific skills of farming. Similarly, AIT provides training on producing large prawn using all-male production technique of "neo males". Some partners also promote biofloc technology which uses probiotics replacing antibiotics and producing the microbial proteins in the culture system to reduce the need of feed. Other innovative VET courses include breeding and farming of catfish, pangasius, shellfishes (oysters, mussels, cockle etc.) and seaweeds. KKU has developed training course on indigenous methods of fish processing techniques to produce smoked and dried fish, fish sausages, powder, paste, crackers, balls so on so that seafood could be stored longer period and transported to areas where fresh seafood is unavailable. Indonesian partners developed and offered farming of seaweed, catfish shrimp and also new product development. In Vietnam RIA1 offered breeding and culture techniques of marine fish species, so that those species could be still available to human if they disappear from the ocean due to overfishing. RIA1 and also NLU developed the course on tilapia seed production technique which was transferred from AIT.

All the internship programs are related to innovation. Asia is leading in terms of aquaculture innovation and exploitation where almost 90% production of aquaculture occur. When students are placed in those farms students learn how innovations are applied to exploit for commercial purposes. A fish hatchery developed as an internship host by KKU produce seed of many species so that she could minimize risk of having no demand if she produces only one species. Similarly in Indonesia, internship hosts are very specialized farms of Eel and snakehead breeding which are very rare as they require very specialize techniques. Another farm, an internship host, produces maggots (i.e. CV Khan's integrated Farm with JFU) as an alternative to fishmeal.

Award Criteria

Typology

Horizontal priorities

Fostering the assessment of transversal skills	<input checked="" type="checkbox"/>
Promoting the take-up of practical entrepreneurial experiences in education, training and youth work	<input checked="" type="checkbox"/>
Promoting the professional development of staff and youth workers in ICT methodologies	<input checked="" type="checkbox"/>
Supporting the production and adoption of Open Educational Resources in diverse European languages	<input type="checkbox"/>
Facilitating the validation of non-formal and informal learning and its permeability with formal education pathways	<input type="checkbox"/>

Linkages

School education	<input type="checkbox"/>
Higher education	<input checked="" type="checkbox"/>
Adult education	<input type="checkbox"/>
Vocational training	<input checked="" type="checkbox"/>
Youth sector	<input checked="" type="checkbox"/>
Cross-sector	<input type="checkbox"/>

If cross sector is selected

School education	<input type="checkbox"/>
Higher education	<input type="checkbox"/>
Adult education	<input type="checkbox"/>
Vocational training	<input type="checkbox"/>
Youth sector	<input type="checkbox"/>

CBHE Aims

Support eligible Partner Countries to address the challenges facing their higher education institutions and systems, including those of quality, relevance, equity of access, planning, delivery, management, governance.	<input checked="" type="checkbox"/>
Contribute to the cooperation between the EU and the eligible Partner Countries (and amongst the eligible Partner Countries).	<input checked="" type="checkbox"/>
Support the modernisation, accessibility and internationalisation of the higher education field in the eligible Partner Countries.	<input checked="" type="checkbox"/>
Promote voluntary convergence with EU developments in higher education.	<input checked="" type="checkbox"/>
Promote people to people contacts, intercultural awareness and understanding.	<input type="checkbox"/>

CBHE Objectives

Improve the quality of higher education and enhance its relevance for the labour market and society.	<input checked="" type="checkbox"/>
Improve the level of competences and skills in HEIs by developing new and innovative education programmes.	<input checked="" type="checkbox"/>
Enhance the management, governance and innovation capacities, as well as the internationalisation of HEIs.	<input checked="" type="checkbox"/>
Increase the capacities of national authorities to modernise their higher education systems, by supporting to the definition, implementation and monitoring of reform policies.	<input type="checkbox"/>
Foster regional integration and cooperation across different regions of the world through joint initiatives, sharing of good practices and cooperation	<input checked="" type="checkbox"/>

Specific activities

Curriculum development	<input checked="" type="checkbox"/>
Modernisation of governance, management and functioning of HEIs	<input checked="" type="checkbox"/>
Strengthening of relations between HEIs and the wider economic and social environment	<input checked="" type="checkbox"/>

Type of project

National project	<input type="checkbox"/>
Multi-country project	<input checked="" type="checkbox"/>

Regions involved

Region 1 - Western Balkans	<input type="checkbox"/>
Region 2 - Eastern Partnership Countries	<input type="checkbox"/>
Region 3 - South Mediterranean Countries	<input type="checkbox"/>
Region 4 - Russian Federation	<input type="checkbox"/>
Region 6 - Asia	<input checked="" type="checkbox"/>
Region 7 - Central Asia	<input type="checkbox"/>
Region 8 - Latin America	<input type="checkbox"/>
Region 9 – Iran, Iraq, Yemen	<input type="checkbox"/>
Region 10 - South Africa	<input type="checkbox"/>
Region 11 - ACP	<input type="checkbox"/>
Cross-regional	<input type="checkbox"/>
Regional	<input type="checkbox"/>
National	<input type="checkbox"/>

Special mobility strand

The project contains a Special Mobility Strand	<input type="checkbox"/>
The project does not contains a Special Mobility Strand	<input checked="" type="checkbox"/>

Involvement of people with fewer opportunities

YES/NO	<input type="checkbox"/>
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Assessment Criteria

Relevance of the project

Relevance of the results

Importance of seafood or aquatic food to human nutrition, income and employment has been increasingly recognized. Seafood is nutritious, delicious and the healthiest among the food items. Its demand is rapidly increasing in each country and globally as more people are becoming aware of the health and thus are shifting their food habits from red meat to white meat and then to seafood. Annually 96 million tons of seafood is caught from the oceans and the natural water bodies while 82 million ton is produced from aquaculture (FAO data). Fish production has to be double by 2050 if the demand continues. Whereas fish catch from the wild is declining and aquaculture is rapidly expanding with the technological advancement often creating environmental problems and hitting back with collapse of aquaculture systems such as shrimp farming. Therefore, seafood insecurity has been a global issue. Ensuring long-term sustainability is important. For both the declining wild fisheries and rapidly increasing aquaculture sector, need more experts to steer the industry towards the right direction. Higher education plays crucial role. At the same time need based short term trainings to help develop specific skill are also important. Therefore, SSNS project was proposed to develop or improve the university curricula to attract more students and train more professionals who are already working in the industry. On the other hand, we hear quite often that private sector's complain about university education is losing relevancy. Therefore, it is very important to make curricula more relevant and build stronger linkages with the industry. The three pillars (MSc curricula, VET courses and internship) of the project are the solutions proposed in the project.

The SSNS project showed very encouraging results in terms of the no. of courses, VET courses and the internship hosts developed during the project period as a results cooperation from a wide range of experts and stakeholders. Even though, initial plan was to develop 20 courses, due to the enthusiasm among the teachers and the driven by the needs, 57 courses were developed (285% more). It clearly shows that SSNS project attracted the attention of and mobilized more teachers than expected. Among the academic degree courses, 49 (i.e. 86%) directly address the sustainability issue having sustainable seafood, environment and related topics. All the VET courses are directly related to sustainability because they are either related to producing fingerlings and fish to reduce pressure on oceans, or processing seafood to extend shelf life or utilizing waste products, and so on. Whereas in case of internship programs, over 2/3rd internship programs i.e. 67% based on the host companies which have direct link to sustainability e.g. breeding of fish to produce fingerlings, production of maggots as an alternative to fishmeal, ecotourism, and so on. Unemployment is another big challenge of the society. While counting the courses which are explicitly related to enhancing the employability, at least 40% of the academic degree courses address employability. More importantly, all the 63 VET courses and 48 internship programs are directly related to enhancing the employability of the student and trainees. Results are very encouraging. Total no. of students taking these MSc courses has reached over 200 which is 227% as compared to 90 students planned. Similarly, number of beneficiaries of VET courses reached 686 i.e. almost double the number planned (360). All the nine Asian HEIs partners will offer those courses and SSNS centres are committed to offer these VET courses and internship programs beyond the project period which have direct relevance to these problems encountered by the local communities and at global level.

Regional cooperation

First of all, the SSNS Project has provided opportunities of collaborating with two partners in Thailand i.e. MJU and KJU which are relatively less active in international collaboration compared to Kasetsart and Prince of Songkhla Universities.. They have now linkages with partners with AIT as well as with universities in Indonesia, Vietnam and in Europe. AIT and its EU partners led curriculum development of aquaculture and fisheries in the region since 1980s but was focusing mainly in Indo-China e.g. Cambodia, Laos, and Vietnam. SSNS provided to expand to Indonesia. Fisheries/ aquaculture program of AIT and its partners have assisted in improving curricula and overall sector in Indochina during the last four decades. This project provided an excellent opportunity of collaborating with leading universities of Indonesia, a major player in seafood industry. More collaborations are needed within ASEAN (Association of South-East Asian Nations) countries which are leading in seafood production and supply i.e. Indonesia, Thailand and Vietnam. Same applies to other partners. In addition, between ASEAN and SAARC (South Asian Association for Regional Cooperation) which include Bangladesh, India, Nepal, Pakistan, Sri Lanka, Maldives and Afghanistan. During the "Final Conference", representative teachers (Program Chairs) were invited from the first four countries. As a result, linkages have been created. They were very much keen to join if the next proposal is developed for curriculum development. More importantly, lecturers from Yangon university, Myanmar attended the conference and expressed their clear need as they do not have MSc degree in Fisheries and Aquaculture. There are many other universities in Myanmar keen on upgrading their degree programs and also train their teaching staff. More work is needed to expand the collaboration among the HEIs of the Asian countries which play or have potential roles to play e.g. PR China, the Philippines, Malaysia and others.

More importantly, SSNS project has created a platform for good cooperation between European and Asian HEIs opening the door for further collaborations. While at the University of Stirling, a number of potential collaborations were discussed e.g. writing proposals for funding from UK donors e.g. DFID, etc. and carry out joint research, student exchanges and publications. A plan about proposal of writing a book, "Aquatic Food Security (AFS)" was brought to the attention during the training session. The book was planned to be edited by Prof Rachel Norman and Dr Margaret Crumlish for the publication by 5M Publishing, UK. Out of 12 chapters planned, SSNS project partners are contributing five chapters; two chapters by editors by themselves, two chapters by Ram Bhujel (SSNS Project Coordinator, AIT, Thailand) and one chapter each by Dr Ioannis Karapanagiotidis (UT, Greece), Dr Mala Nurilmala (IPB, Indonesia), Jorgen Lerfall (NTNU) with Amaya Albalat (UoS). Hopefully book will be published in 2022.

Similarly, during the NTNU trip, partners from Asia were talking about the possibility of join collaboration for research and use of sophisticated laboratory equipment e.g. NMR (Nuclear magnetic resonance spectroscopy) which is very expensive but more precise. More collaborations are expected.

Quality of the project implementation

Description of the implemented activities

Seven Workpackages (WPs) of the project were implemented as follows:

1)Initiation – A consortium was formed by signing partnership agreements. Project was implemented from Oct14, 2017. First kick off meeting or the Inception Workshop involving all the partners was organized during April 18-21, 2018. Main purpose of this workshop was to familiarize among the partners, goals, objectives and commit to the roles and responsibilities.

2)WP1 – Needs assessment or Gap analysis: started immediately after the inception work to assess the existing curricula in Asia and Europe, analyze gaps in curricula and VET courses searching the curricula through internet. Five reports have been produced i.e. one each from three Asian partner countries, one from Europe for curricula, and one separate report of VET courses.

3)WP2 Development – Development of capacity of the academic staff started with the two trips to Europe; namely, NTNU (Sept 5-9, 2018) and University of Stirling (Feb 11-16, 2019) where three Asian teachers (per partner) had opportunities of study tour and interacting with European academicians and exposure to better teaching-learning environment including advanced level laboratory facilities. Development of course outlines following the template of the course outlines provided to them.

4)WP4-Delivery: After the courses were developed, they were accredited or incorporated into the existing curricula. The first set of courses were offered in August semester 2019. Altogether 22 courses were offered to the students in 2019 followed by 31 courses in 2020 and 42 more courses in 2021. By then, nearly 90% of the courses developed have been approved/incorporated and 65% courses have been offered to the students i.e. 37 courses which 1.85 times more than targeted (20). During the delivery period, teachers training were organized in Thailand (Sep 15-21, 2019), Vietnam (Nov 25-Dec 1, 2019) and Indonesia (virtual, June 22-26, 2020). In this WP, all the nine Asian partner HEIs purchased equipment with value ranging from 20,000-31,000 Euros. In addition, 48 internship programs (target 45) were developed to incorporate in the curricula. At least 20% of them were exploited and the remaining were not possible due to COVID-19 situation. They will be used later.

5)WP4-Acreditation: After the courses were developed, they were accredited or incorporated into the existing curricula. Letters of confirmation were obtained from the authorities (Deans, higher authorities or their delegates).

6)WP5- Quality: This Workpackage was dedicated to quality monitoring and assurance and given the responsibility to EuroTraining, an experienced partner. Quality monitoring started since the beginning to the end producing reports by semester. There are five periodic quality reports and also a final evaluation by an independent consultant. In addition, quality was assessed asking feedback whenever major events were organized e.g. Kick off meeting, two European trips, and three Teachers' training.

7)WP6 – Dissemination: The project idea or the issue sustainability of seafood and nutrition security, its goal and objectives, and the results or outcomes were disseminated through various ways to reach thousands of audiences e.g. over 6,000 through conference presentations, over 5,000 through website visitors, well over 15,000 through social media, over 3,000 brochures/flyers distribution and so on. Total direct beneficiaries i.e. staff/teachers (95) and students (more than 224 students, although number shows 666 students but they have been double counted) and indirect beneficiaries (getting information, knowledge about the project issues has reached over 35,000 individuals.

Quality Assurance Measures

WP5 was dedicated to quality monitoring and assurance. EuroTraining, EU partner was fully responsible for this. A quality board of 13 was formed including one expert from each partner. They were asked for every output to check before declaring them as final documents. Monitoring of the quality started since the beginning to the end producing the periodic reports each semester. There are five periodic quality reports and also a final evaluation by an independent consultant. In addition, quality was assessed asking anonymous feedback from the participants whenever major events were organized e.g. kick off meeting, two European trips, and three Teachers' training. Results showed that:

The followings were the measures of quality assurance implemented and brief results are presented:
Inception: Quality was assessed developing a questionnaire with rubric of 1-5 scale (worst to best). The results of the first evaluation of the kick-off meeting were very satisfying with the score between 4 & 5.

Study tour-Norway: The rating system used during this evaluation was based on a scale from one (1) to six (6) and the trip was rated as Very satisfying with the score between 5 and 6. Study tour, UK rating system used the scale from one (1) to six (6) and the trip was rated as Very satisfying with the score between 5 & 6 (same as NTNU Trip)

Periodic evaluation by semester: Semesters 1, 2, 3, 4: The overall feedback on the implementation of the project's tasks and activities for the first two semesters, can be considered positive.
Sem 5: Overall feedback on the implementation of the project's tasks and its activities during the 5th semester was positive, even though 100% of the partnership had to work from home-based offices due to the quarantine status impeded worldwide. The partners' fulfilled their roles and responsibilities indicates that the progress of SSNS project was developing on a stable basis of cooperation and efficient communication.
Sem 6: The 6th semester was overall reported as successful by the consortium, which voted in favor of a dynamic project implementation. All aspects of the project's progress were highlighted as positive, while partners declared that faced no major challenges, apart from some managerial aspects derived from COVID-19 restrictions for travelling. The organization of online meetings was also pointed out to be successful, while the exchange of information was continuous and stabilized, amid the lockdown.

7th sem: the overall coordination and management was positive.

8th Sem: Questionnaire were sent to the partners; however, due to low response due to COVID19, our partner was not able to produce those reports. In addition, Quality Board Members were asked to go through all the documents available online in September-October 2021 for them to have their final views, in addition to having feedback on the previous periodic outputs. No comments were received. Instead, they responded to the online questionnaire form for final evaluation by the external evaluator.

External project evaluation: A retired professor of Aquaculture was contracted as independent consultant to evaluate the project. He was provided with all the information including proposal, output results and all available results available online on the project webpage. Using a evaluation toolkit developed by SSNS project, he has assessed the quality of curricula, VET courses, internship programs, equipment etc. with the grade ranging from E (excellent), V (very good), G (Good) and P (poor). In most of the cases, E grade has been give and few are V and non of them lower than that. He also conducted an online survey to gather opinions of quality board, project managers, lectures and students. Overall rating was 9 out of 10 (i.e. 90%).

Equipment

Lab equipment purchase could not be done until the mid-term reporting time. Preparations were made to revise the list of equipment as the initial list submitted in the proposal was a common list. While writing the proposal, it was in a hurry to go through all those procedures and find out the needed equipment. Even if the list were pre-determined, list needed to be changed because purchase occur after 2 years or so. Revision in the list of equipment was done going through each partner's laboratory unit. We proceeded to revise the list of equipment going through all the laboratories of the partner institutions and assessed the needed ones and their specifications including costs. After assessment, all the partners provided the list with expected prices in their official letters. All the partners' lists were forwarded to the EU Officer. They were approved and partners started purchasing them. Initially, it was thought that equipment could be purchased from the same source in each country but it was found to be very tedious as the equipment of each partner were very different. They could not be sourced from the same company. Partners have obtained three quotations and selected the one. Purchasing equipment was thought to be easier but when it came to the actual purchasing time, partners found quite difficult. Somehow, they have managed to purchase as per their need and plan. Unfortunately, COVID19 started while purchasing was going on. Due to COVID-19 some partners (e.g. JFU, NLU) encountered some delay in delivery but most of others could manage before COVID19 or during.

AIT – A laptop, printer and Video camera were purchased before mid-term report to use for project management and teaching. Other lab equipment were purchased after mid-term arranging a public notice/tender following the EU rule and AIT procedures as the budget was over 25,000 Euro. AIT had lost many equipment during heavy flooding in 2011. Until this project, it was not possible to resume the lab fully as before. The SSNS project support has been very crucial for the aquaculture program of AIT. Altogether 21 items were purchased. All the equipment have been used for teaching (practical classes such as nutrition/proximate analysis etc.) and also for training courses. MJU purchased 6 items and KJU only 3 items but important and expensive ones (machine for making floating fish feed, autoclave etc.) which were problem due to lack of fund. Feed making machine is used for teaching nutrition and feed technology courses and also for training to professionals.

Similarly, IPB purchased temperature-controlled centrifuge and shaking water bath which were quite expensive ones due to which they were not able to get funds from their university. SSNS project contributed greatly. UGM purchased Biosafety cabinet, CO2 incubator etc. which cost a lot due to which they were not able to purchase before. Similarly, JFU purchased color meter (color analysis), the most expensive one and needed for color analysis, portable spectrophotometer, portable water quality meter etc. While in Vietnam, CTU purchased 13 items including refrigerated centrifuge, incubator, and others. Similarly, NLU purchased 12 items including Biosafety cabinet (similar with UGM), food dehydrator and so on. Whereas RIA1, requested big Screen for teaching or classroom and microphone-sound system as they mentioned that most of their lab equipment were supported by other donors in the past. All the partners have kept their equipment in their existing lab sticking the EU logo, but inventoried in their labs because all the partner institutions offer lab based courses and they have lab facilities. The equipment purchased are additional ones. They did not need to create any new lab.

Curriculum development

Curriculum development exercise started from the first trip to NTNU. Twenty-six teachers from Asia were together discussing each other and interacting with the European teachers. They were exposed to new environments. Five teachers of NTNU (Anita, Erin, Eva, Alireza and Bjorn) gave lots of ideas of designing curricula and delivery methods. A course named, "EiT (Experts in Team)" was interesting. It was developed to link the society to solve their problem which includes identifying a problem of the society and using it as base for teaching student in groups. Community is governed by many factors for which they needed to have a group of experts to critically analyze and find a solution by testing. Students of various background e.g. agriculturist, economists, engineers etc. serve as experts. The group visited Blu Competence Centre (BLAT Kompetansesenter). It is 1 out of 4 approved centralized project from EU ranked as the 2nd best project. VET courses are offered for participants of 12 countries. Teachers also visited a Salmon farm (LeRoy) and its processing plant. Asian teachers understood how the universities and private sector collaborate and help develop the salmon industry in Norway, the leading producer and supplier of salmon worldwide.

At NTNU, Nicholas (EuroTraining) provided a training session on Virtual Learning Environment (VLE) platform developed for SSNS project and the Moodle software.

Similarly, trip to University of Stirling (UoS) further added to the curriculum development. Jonh Bostock presented the curriculum structure of UoS, Simon presented about continuing professional development, Prof Neville about linking teaching with research and industry, Eunice gave "making the most out of masters at the university". Andrew provided insight about another EU funded project i.e. Blue technology master for blue career". David Little presented about interdisciplinary research and societal problems. Amaya and Margaret demonstrated the practical sessions. Project Coordinator (Ram), also presented 17 methods of teaching and started discussion. After having so many ideas/knowledge, teachers were asked to develop course outlines (1/each) giving a template which was developed by the previous EU funded project coordinated by AIT. Teachers were asked to write learning outcomes during a practical session. Moreover, Ram led the discussion about the course outline e.g. course objectives, learning outcomes, pre-requisite, course contents, lab session, field visits, case studies, time distribution, evaluation scheme, etc. Each partner's group agreed to develop six course outlines and the VET courses outlines. Ram also showed a sample of a VET course. They also discussed about the internship. None of the HEIs has an internship for MSc programmes that they are running. Ram presented a previous internship sample developed by AIT as an example format. As planned, it was agreed that each HEI should develop at least three (3) internships for their SSNS centers.

The two trips to Europe were so fruitful in developing the capacity of Asian teachers. After these trips, teachers started developing outlines for MSc course, VET, and internship programs. Project Coordinator himself edited some course outlines. But it was so much. During the Teachers training in Thailand, weaknesses in some course outlines developed by Asian teachers. Therefore, it was suggested to edit by European teachers and also some teachers of Asia based on their expertise or subject areas. Seven teams of (2-3 experts) were formed for each area e.g. water quality and environment, breeding, nutrition, etc. which have edited the courses outlines to correct content, formats and language errors. Although, this was not planned but we did as per the need for quality.

Teaching / Training Activities

A teachers training was organized in each partner country after the courses were developed. The idea was to assist as well as monitor the teachers while they teach the courses they had developed as a part of SSNS project after getting new and innovative ideas from two European study tours or training to incorporate. The first training of teachers was organized in Thailand during September 15-21, 2019. It started from AIT then moved to KKU and then to MJU. Initially, it was planned to be AIT only, but as per the suggestions by other partners, it was split to other partners as well. All the partners from Europe and teachers from KKU and MJU arrived at AIT to participate in the training. The training program started with a presentation “how to be and good and effective teacher” by Margaret from UoS. Two teachers of AIT demonstrated their teaching skills as a part of their regular classes to their students. European teachers and the teachers of KKU and MJU, observe the teaching and also had evaluation sheet to score for various skills / methods they used with feedback. Feedback was also asked to the students keeping the teachers outside the class so that students would not feel uncomfortable to give comments. Feedback from the students and also other teachers (European and KKU & MJU) were given to the AIT teachers. Lots of suggestions were provide which form the basis for improvement in teaching skill and management. Suggestions included time management, overloaded with contents (long lectures), need to encourage students to engage, provide teaching materials in advance via online etc. The group moved to KKU and visited some fish farms and fishery stations which were developed internship hosts.

Same method was applied at KKU. Two teachers performed their teaching to their students. In between two teaching sessions, a presentation on “Training methodologies and tools” developed as a part of SSNS project was given by a European teacher followed by a role-playing assigning different groups as stakeholders. Similar way, students were asked for the feedback. Same method was applied in MJU after KKU. The project Team discussed about the effectiveness of the teachers training program because curriculum structure was not presented and not clear to European teachers. At the same time, the course outlines were found to be below standard. Therefore, the project team suggested to do differently in Vietnam and Indonesia.

After Thailand, teachers training was organized in Vietnam during Nov 25-Dec 1, 2019. Program started from NLU then moved to CTU. Due to long distance, it was not possible to go to RIA1. First teachers gathered at NLU. Project team changed the strategy. Instead of teaching demonstration, whole curricula structure of NLU and RIA1 were presented by the partner coordinator. Project team discussed about the curricula. Teaching, lab and field facilities were observed. VET course and internship programs were also presented and discussed. The whole team moved to CTU, where curriculum structure of CTU, VET courses and internship programs were discussed. In both the places students were asked to give feedback.

Unfortunately, planned trip to Indonesia was cancelled due to COVID19. It was postponed or organized in June 22-26, 2020 but virtual (Zoom). The format of the program was the same – mostly presentation of curricula structure, VET and internship programs.

In conclusion, the method used in Thailand probably was the better one as teachers could have an opportunity to perform, practice or demonstrate his/her skill in front of other teachers and get feedback from them in addition to the students. However, it is equally important to look into the curricula structure, and contents of each course outline to ensure quality.

Governance reform

The project did not have any direct objectives in this area. Nevertheless, all the partner HEIs have learned a lot and they have interactions with their higher authorities. In some cases, higher authorities of HEI such as President/Vice-President, Rectors/Vice-rectors and Deans were also involved in the project (e.g. Europe trip visit, welcoming during teachers training, and also invited for final conference), which would help them reform whenever they get chance to make reforms in their institution e.g. how curriculum development should be done, how they can be linked to society, how delivery could be made more effective, how accreditation and quality assurances should be done and so on. In addition, establishment of SSNS centres as a separate, independent and sustainable unit and giving responsibilities of training, internship and outreach activities is one of the examples of some sort of reform within the academic environment. HEIs normally follow the tradition of simply classroom teaching by giving lecture except few laboratory classes. As a result, academic degrees are no more exciting and relevant because young generation students can get information easily through internet and social media. Therefore, teaching and learning should be more practical field-based, linked to community, their problems and solution-oriented. But universities lack appropriate mechanisms or units to handle them, and also active lecturers as managers. Therefore, universities need reforms. The idea of proposed SSNS centres to bring changes in governance system as well in addition to the simple teaching and learning mode or the environment.

More importantly, internship programs have been realized increasingly important because class-room based teaching and learning lost its relevance and practicality. Many newly graduates have been found to be clueless when they are interviewed and often hired to take up jobs. Internship has been highly regarded as essential to acquire practical work experience (on-the-job) training developing. SSNS project team has emphasized its need and tried to implement in Asia incorporating internship programs into the curricula as its requirement. As it links with private sector, it is very different and new direction for the academicians to deal with. Many professors used to get away from collaborating with private organizations thinking that they will have conflict of interest. This direction is being applied in many HEIs in Asia which requires some policy changes and also logistic arrangements can be considered as reforms in the academic institutions where teachers are overloaded with just to give lectures and do research in their facilities and confinement. With the internship program, a person from the company can serve as a committee member of student thesis. In some cases, depending upon the interest, some of the private company executives can also serve as board member or advisory body of the universities so that they could provide perspectives from private sector's need in education system thereby help bring reform in education system. However, it was not planned under SSNS project, but it could be recommendations for the future initiatives.

Links with society

Asian teachers realized that how emphasis is given while developing curricula to link to the society during the two trips to Europe. For example, EiT (Experts in Team) of NTNU showed how societal problems can be critically analyzed and solved establishing a team of students as experts from different backgrounds within each university. Similarly, visits to Blu Competence Centre (BLAT Kompetansesenter) in Norway and two Salmon farms helped understand how universities and private sector collaborate. Realizing that Asian teachers returned with much enthusiasm. As a result, they developed almost 3 times more courses, 2 times VET and enough internship programs compared with the targets.

During the teachers' training in Thailand, private farms were visited which serve as internship hosts giving similar emphasis as in Europe hoping they could do the same thing. Those farms have been used for organizing VET courses and also for students for internship and also practical classes for the students and trainees. All the teachers involved have learned the need and rewards they get when they link their curricula to the society and their concerns. Internship/training reports show how students and trainees could learn in-depth and do practice to get hands on skills in the private farms. Society has full of problems surrounding them such as food and nutrition insecurity, under- or un-employment, low income, declining fish catch and the stock in the natural water bodies, air and water pollution, and environmental degradation, deteriorating health condition, gender discrimination and so on. Therefore, society expects help and supports from the academicians and students. There is popular saying that "Society has problems, but universities have more departments, not the solutions". Unless teachers and students do not go out and help solve the problems, that saying remains true. Therefore, our approach to emphasizing link to society and social problems have a big meaning. As a result, the courses developed during the SSNS project period showed all i.e. 100% VET courses and internship programs have direct link to enhancing employability and at least 40% of the academic degree courses address employability. As mentioned earlier, 49 courses (i.e. 86%) directly address the sustainability. More importantly, all the VET courses are directly related to sustainability e.g. producing fingerlings and fish to reduce pressure on oceans, or processing seafood to extend shelf life or utilizing waste products, and so on. Whereas over 2/3rd internship programs i.e. 67% based on the host companies which have direct link to sustainability. In addition, all the developed VET courses have connections towards solving problems of the society such as gender discrimination, health and nutritional deficiencies, low income, declining wild fish stock and deteriorating environment.

Huge participation of students and great successes of Internship Info Days indicate that society responds when universities extend their hands to reach out. Private companies offered free accommodation to the students indicating there is good scope. SSNS envisioned that SSNS centres will be very active and play a role of "Solution centres" similar to the medical hospitals run by universities. Aqua-Centre of AIT has been so active since its establishment in 2014 or even before in the name of "Aqua-Outreach". The sector could flourish if SSNS centres with good leaders and vision, could play similar roles. RIA1 is doing great in Vietnam, CTU and NLU should make a move. Similarly, KKU and MJU in Thailand need big push, also the partners in Indonesia. SSNS project was a good attempt and AIT along with EU partners will continue to give their hands.

Quality of cooperation

Involvement of partners and stakeholders

SSNS project had a clear division of work within the consortium. Each of the seven workpackages were led by different partners as follows such as WP1 by NTNU, WP2 by UStir, WP3 by UTH, WP4 by IPB /UGM, WP5 EUROTraining, WP6 by AIT and WP7 AIT. For WP1, NTNU led the European side to assess the existing courses conducting a survey and desk studies, other assisted them. EuroTraining collected information about VET courses. EuroTraining did quality evaluation for each activity and outputs. EuroTraining helped create VLE system. Similarly in Asia, MJU led the needs assessment/gap analysis for Thailand, CTU for Vietnam, and IPB for Indonesia. NTNU compiled all and AIT coordinated. SSNS Centre's framework was developed by RIA1. Reports on Internship and VET courses were produced by JFU. Curricula evaluation kit was by UGM. Internship Info days were organized in each country involving all the partners. Curricula delivery / evaluation report was prepared for each country by each partner and finally compiled by RIA1 and NTNU. As planned teachers training for Thailand and final conference were coordinated by AIT in addition to having overall coordination role. Teachers training in Indonesia and Vietnam, CTU and IPB led in their respective countries. Dissemination is mainly led by AIT but all the partners did their activities. Cooperation among partners and their needs were accommodated well e.g. IPB brought three additional lecturers to AIT for Inception Workshop bearing the costs by themselves. That was a sign of excitement shown by the partners. Similarly, RIA1 sent 4 lecturers UK and two for NTNU instead of 3 in each place because RIA1 had more collaboration with NTNU but not with UoS. As per suggestion, the project team split teachers training to have some activities in each partner within the country instead of having in one place. In Thailand, it started from AIT, then moved to KKU and then to MJU instead of organizing in AIT only. Similarly in Vietnam, the training started from NLU and then to CTU instead of having in CTU only as the point of entry is HCM city where NLU is located. There are other collaborations too beyond the SSNS project e.g. IPB (P4) and UGM (P5) asked the Project Coordinator to present about the project for their conference during 8-9 July and the other in 9-11 Sep 2019 which were accepted as a part of dissemination, though they were virtual. A book "Aquatic Food Security" is being written coordinated UoS and to be published by 5M, UK. Seven chapters are contributed by SSNS partners. SSNS project had many other stakeholders; especially, lecturers (over 50) who developed the courses, students who attended the teachers training program and internship info days (over 300) in Thailand, Vietnam and Indonesia and provided their feedback on courses and teachers' delivery methods. Similarly, many private companies work with partner universities to carry out joint research e.g. AIT signed contract with 4 internship hosts, and also is currently testing the phytogetic products for tilapia from European companies namely, Biomin, Delacon, Lucta, Patent etc. NLU (P13) & Can Tho (P11) also have similar supports from private sector. Some students are informally placed in these companies as interns, but SSNS would like to expand it to make it formal and as a part of curricula, so that students can be bridges for continuous improvement in curricula. Internship hosts contribute as external stakeholders/non-academic sector. Our target was to reach about 45 SMEs but 48 have signed agreements for internship and listed as internship hosts. Executives of at least 3 companies per partner presented during internship info days.

In conclusion, there was very good cooperation in implementing the SSNS project from all stakeholders.

Management of the grant

The main medium of information exchange with partners has been the email communications which started since the preparation of the proposal. AIT as a Lead Partner prepared MoAs and send to the partners through email. AIT signed bilateral memorandum understanding (MoU) outlining the responsibilities of each partner and based on which grant amount has been split among all the partners. An original MoA between AIT and each partner was sent to each partner by DHL. These MoUs are the formal official documents of formalization of collaboration in which grants were planned to transfer in four installments.

The first face-to-face “Kick-off” meeting or inception workshop was organized during April 18-21, 2018 which provided opportunity of familiarizing the rules of managing the grant and also introducing them among the partners. After that, there were no face-to-face separate coordination meeting. All the face-to-face coordination meetings were organized during the gathering events such as during the trips in Europe, teachers training Asia. Coordination meetings were organized via Skype and later using Zoom.

All the reports and documents from partners were obtained via Google drive shared with all the partners. Initially it was quite difficult to manage files and filing systems to identify and arrange them. Project Coordinator made the rules of adding partner no. and short name of the person/partner then particular activity/deliverable e.g. P7-Lerfall-Travel1-BKK and so on.

Concerns about how funds would be managed to disburse to partners by AIT after receiving from EU. AIT received 50% of the total budget as the first pre-financing in April 2018. Invoices from each partner for the 1st installment (30% of total budget) were obtained during Apr-May, 2018 and first installments were sent to the partners within May 2018 except the University Stirling which was done in June 2018.

For the second installment (20% of total), invoices were obtained in Oct 2018. Funds were transferred between the first week of Nov to the first week of Dec except for Univ of Thessaly which sent invoice late due to change of Rector and two Thai partners due to new rules, their installment was sent in March 2019.

While submitting the mid-term report in mid-April, AIT submitted finance report that 70% of the 1st pre-financing was spent so the 2nd pre-financing (40% of the total budget) was received from EU in June 2019.

Immediately after receiving the 2nd pre-financing, budget for equipment (i.e. 3rd installment) was transferred to Asian partners in September 2019 after they finalized the list and worked out the budget. However, it took longer to transfer to the two partners from Thailand. It was in February 2020.

Fourth installment (or the third for European partners) was disbursed during September – November 2019 depending upon when invoices were received. Fund transfer was delayed in sending to the partner NTNU and was done by February 2020, and University Stirling did not send the invoice therefore was reserved for the final settlement. It clear indicates that funds were disbursed as planned except few cases. There was no issue. Final settlements will depend on the final audit and evaluation by EU based on the rule of exchange rates and other eligibility criteria.

For equipment purchase, except AIT, all other partners requested not to go through tendering process and work out the equipment needed within the budget of below 25,000 Euro to shorten the process as it was late already.

IMPACT AND SUSTAINABILITY

Impact

Individual level: The SSNS project mainly emphasized on teachers' capacity development in curriculum development and effective teaching. No teacher had any relevant training after joining as a lecturer. When a person gets PhD, he/she is considered qualified for teaching, but may not be skillful. Teaching is a special skill which is not provided during PhD studies. This project has enhanced teachers' capacity. Nearly, 50 Asian teachers got trained. Training started from NTNU where they learned about student centered teaching and also how community's problems are solved forming a team of student experts (EiT course) and also to work with private sector (i.e. LeRoy).

Similarly, the trip to UoS provided more skill of developing curricula e.g. writing learning outcomes and overall outlines for MSc courses, VET and internship programs. They also learned new techniques of teaching, for lab e.g. animal welfare issue while using for teaching/research, and also how to link teaching with industry (e.g. Mowi). These skills, reflected in their course outlines and while teaching, will remain with them forever. Most of the students have given feedback mentioning changes in teaching methods of the teachers.

Institutional level: Each partner organized several rounds of meeting to discuss about curriculum development at curricula, they have involved many other individuals and authorities within the university system. Lessons learned from SSNS project has been applied, which has big impacts at the institution level. More importantly, SSNS centres are avenues to reach out, very important impact. The centres organize VET courses and generate incomes to continue their activities. Universities provide some budgets. For internship, a small amount of fee is charged, reasonable as they may get free lodging and other supports. More importantly, these internship programs are also offered online to the students from Europe and developed countries charging a bench fee. Its a roll out program with a brand name "Asian Internship Program". All the partners benefit. Marketing has already been started. Demand exists for internship and specialized training. Over 13 inquiries were received so far.

National level: Some of the partners e.g. JFU and IPB have mentioned they were invited to present about the SSNS project and its idea to higher levels including policy level and ministerial level. SSNS partners in Thailand and Vietnamese partners to the same whenever there are planning and policy making meetings.

ASEAN (Association of South-East Asian Nations) has a network of universities. All the Asian partners of SSNS project are the members of fisheries universities of ASEAN. They organize an international fisheries symposium (IFS) every 2 yrs. CTU and AIT to present a paper on "Educational Networking: An important pillar for innovation and sustainable development of aquaculture" on 18 Dec 2021. SAARC (South Asian Association for Regional Cooperation) covers Indian sub-continent where fish consumption and aquaculture development is lagging behind. SSNS outputs were shared with professors in Bangladesh, India, Nepal and Pakistan were invited for the final conference. Outcomes have been shared. Fisheries Society of Bangladesh (FSB) has invited the SSNS Project Coordinator to present a paper, "Sustainable seafood and nutrition security (SSNS) through higher education". Similarly, the project Coordinator presented about the SSNS project at Agriculture and Fisheries University in Nepal in May 2019. To cover SAARC countries, a similar proposal has been developed to submit in Feb 2022 with a view to expanding it to Bangladesh, India, Myanmar, Pakistan and Nepal. Hopefully, it will be selected.

Dissemination

During the project period, SSNS partners presented the paper over 30 conferences reaching over 6,500 people. About 3,000 brochures have been printed. Based on the partners report over 5,000 have been distributed (hard copies and including soft copies). AIT printed 300 brochures twice and distributed during activities and visitors on several occasions. Similarly, other outputs such as teachers' guidebook and brochures of VET courses and internship programs were distributed. NLU has mentioned that they distributed 300 brochures during the Thematic Brokerage Events in HCM City alongside Vietfish on 30 Aug 2019. Similarly, other partners have done the same.

Project website: The project website <https://www.seafood-security.org/> stores reports and other outcomes, and also help disseminate project outcomes. It is hosted wix.com with a nominal fee which will be continued by Aqua-Centre, of AIT and used to advertise training and internship programs keeping all the partners intact. Aqua-Centre will coordinate when students or trainees want to go to another partner institutions. The webpage includes "Home, Partners, Activities, Outcomes, VLE, Apply button contains the information by Workpackages (WP1-7) and also the links to their outputs and deliverables. The most important part is the Outcomes as it contains major deliverables such as curricula, VET courses, internship, SSNS centres, quality reports and mid-term and final evaluation reports. etc. A VLE platform is a link for access to Moodle based programs for teachers and students for online teaching and learning. Teachers' manual and Users'/students manual are helpful part of it. More importantly, Apply button is to receive online applications for training and internship programs. Any interested person can send inquiries or apply.

a) Other partner's websites: dissemination has been done by other partners as well which are given below:

<http://serd.ait.ac.th/2019/01/07/aarm-continues-to-lead-curriculum-development-program-in-asia/>
<https://aqua-centre.org/projects>
<http://www.fishtech.mju.ac.th/WEB/main/index.php>
<https://ags.kku.ac.th/th/2020/07/23/>
<https://ag.kku.ac.th/pukkr/ssns/>
<https://www.ntnu.edu/ibt/research/food-safety/projects#Curriculum>
<https://app.cristin.no/projects/show.jsf?id=608879>
<http://fof.hcmuaf.edu.vn/fof-32878-1/en/on-going-project-ssns-curriculum-development-for-sustainable-seafood-and-nutrition-security.html>
<http://www.susaquastirling.net/blog/2018/8/30/eurastip-europe-asia-collaboration-workshop-on-education-training>
<http://fof.hcmuaf.edu.vn/?lng=en>
<https://www.researchgate.net/project/Sustainable-Seafood-and-Nutrition-Security-SSNS>
<https://caf.ctu.edu.vn/en/training.html>
<https://fof.hcmuaf.edu.vn/data/file/1-establish%20the%20center-6-March-2020.pdf>

b) Social media

A social media group, "Sustainable-Seafood-Net i.e. <https://www.facebook.com/groups/Sustainableseafood/> was created for dissemination of project outputs, promote activities and also do campaign about the issue of global seafood and nutrition security. All the activities and news were posted in this social media side by side in the group for "Aqua-Centre" of AIT. It has reached over 16,200 members. SSNS related activities and news are shared in Aqua-Centre which means 16,000 people immediately are reached. It also attracts the attention of common people towards the issues. When a person e.g. Ram shares on his timeline, nearly 5,000 friends will receive it. If few others share, it can reach easily hundreds of thousands of people. Social media has created good awareness about the project and the issue of sustainability of seafood supply.

Sustainability / exploitation of results

Many courses identified and developed during this project period have already been incorporated since July/August 2019 offered by the Asian partners. Asian partners are in the opinion that the new courses or improvement in the existing courses has showed some signs of attracting more students. Therefore, these courses will be continued to offer. More importantly, the teachers engaged/trained will continue to improve their other courses as they have learned the process and have the templates of the courses. Over 50 new or improved courses have already been developed and accredited and/or incorporated into the new curricula of SSNS program or existing related programs. Those teachers will also play key roles in their university for other departments to serve as model and also serve as trainers. Therefore, impacts of the project will have more than thought. Some university have newly established departments / faculty of aquaculture or fisheries. They can use these courses. We have a university in Ghana already utilizing the courses developed by the project (Annex 1).

The internship programs developed during SSNS project are listed in an online project page giving a Asian brand name (Asian Internship Program (AIP) at this link. The Asian Internship Program will be offered to the students of SSNS partner universities as well as students from universities of Asian and European countries. These hosts will be oriented to accommodate foreign students from other Asian and European universities. After the project period is ended, the internship program will run charging a reasonable bench fee depending upon the country and also type of internship host. Agreements have already been made between the host and universities making the roles clear for intern students, professors and supervisors at the host organization. Some private companies/farms provide free accommodation and also transport and/or food or any other incentives which will attract self-funded students, ensuring the continuity in the long run.

The courses developed during this project period were already offered, and added to the existing list of courses. These courses were offered charging the fees to the participants or donors who supported them. Typical 1-wk program tuition fee may range from 10 Euro (e.g. Vietnam/Indonesia) to 1,000 Euro (e.g. AIT). Some training courses are sponsored by their respective governments, so they can go on and on as long as demand exist. Aqua-Centre of AIT has been organizing 5-20 training and study tour programs each year. Similarly, European and other Asian partners have been encouraged to do the same under the umbrella of SSNS Centres.

Unexpected outcomes/ spin-off effects

There are a number of unexpected outcomes obtained from the SSNS project which are listed below:

- Number of courses developed/improved was unexpectedly higher than planned such as 57 courses, whereas planned was only 20. All of them have been recognized and amongst them 35 have been already delivered
 - About 224 students (expected was 90) or beneficiaries have taken at least one course but most of them many more.
 - VET courses planned was 27 (3 per partner) but total reached number has 63. All the partners developed more than 3 courses and Khon Kaen University had 18 courses developed.
 - Number of trainees or beneficiaries of VET courses reached nearly double, well above the expectation.
 - Despite COVID19 pandemic, internship programs which needs field work, were developed more than expected.
 - VET courses and internship programs have been developed as spin offs to continue offering to anyone around the globe. An online application form has been created. More than 13 inquiries and applications have already been received during 2020-2021 but due to COVID19, they have not been arranged yet. But it can take off anytime soon when the travel restrictions are lifted.
 - VLE (Virtual Learning Environment) or the online teaching became compulsory due to COVID19 pandemic. Its need was envisioned by the SSNS project team well in advance and included in the proposal.
 - Teaching by real practice: The project coordinator tried an innovative teaching by actually conducting an experiment during COVID19 pandemic involving students as a part of Aquaculture Nutrition and Feed Technology course during the semester "August – December 2021". Byproducts (fruit peels) of some local fruits (i.e. Rambutan and mangosteen) were collected, dried and used as fish feed ingredient. It was very exciting for the students when the experiment was designed and given the responsibilities to them. One of the students who was on-campus, was feeding the fish daily, monitoring the water and changing weekly, and also taking samples for proximate analysis and water quality analysis in the lab to collect data once in 10 days using the equipment purchased with project funds. A research staff taught the students via Zoom, the student who was on-campus did the work, and a senior student used camera to broadcast live to other students who joined via Zoom. Data were shared to every student in the class. Students were trained to write a paper using those data in three steps; 1) writing an introduction, objectives and problem statement as draft 1. 2) they were trained in experimental methodology then asked to add methodology in the draft 1 to produce draft 2. After that they were trained on data analysis using the data generated by that experiment. 3) They were then asked to write results and discussion showing examples of published papers on the relevant topic and explaining about how the references are cited and listed. Students were graded based on their quality of their papers (3 drafts) and a common paper was produced. Efforts are underway to publish it in a journal. Students were found to be very excited to see the results as new feed ingredients were being tested, and they were also happy to know that a paper might be published including their names. If that happens, it should a good example. Their capacity of doing research and writing will be enhanced thereby employability will be enhanced.
- Thank you.

Statistics and Indicators

Indicators for the Programme

Type of equipment:

- books and pedagogic material
- audio-visual equipment
- Computers and software
- lab material
- Other
- Not Applicable

For Curriculum Development projects

- For Curriculum Development projects

Courses updated (/developed/accredited) in line with Bologna principles.

Almost all the courses developed are taught as full-fledge courses over a semester of 15 weeks. The courses have minimum credit of 2 which is expressed as 2(2-0) which means it contains 2 hours of lecture per week with no lab class. Based on the ECTS calculator (<https://msingermany.co.in/ects-credits-calculator/>), the courses which show credits 2(2-0) will be equivalent to 4 ECTS, if a student takes that course and gives 6 hours per week for self-study. A total of 26 courses carry minimum of 2 credits or 4 ECTS. Other have more than that. Many of the courses have 3 hours lecture and a laboratory class of one session (i.e. 3 hrs), then the course will be equivalent to 6 ECTS. That means the course developed by SSNS project partners carry 4-6 ECTS.

Almost all the HEIs of the current project are members of the ASEAN University Network (AUN). Within AUN, there is credit transfer system called ACTS (ASEAN Credit Transfer System) which is very similar to Europe and ECTS. AUN have already established framework for student exchange which is happening between ASEAN and European universities. Therefore, if the courses are recognized by their HEIs, they are also recognized someway. However, exchange programs are occurring more in certain fields than others. In seafood sector it is not so common. Actual accreditation or recognition of programs and direct credit transfer from Asian HEIs to European universities or vice versa are limited.

AIT attracts several groups of students from Europe each year for a semester or so for some courses/programs or field work. They earn credits out of that for their degree programs in European universities. Some of the other partners do the same; however, in the seafood sector or in Fisheries and Aquaculture field, it is still rare. This has to be the next level of project planning to help further upgrade and accredit the curricula of Asian HEIs by some authorized European agencies. A new project might need design to apply specifically Bologna principles and processes with student and staff mobility which was not included in the present project. For this we think curricula of Asian HEIs need further refinement or fine tuning going thoroughly each course outline, its teaching/learning materials, laboratory techniques/methods, assignments, evaluation methods and so on. Teachers need advanced and comprehensive training and interactions. More exchange of teachers (from Europe to Asia and vice versa). Online teaching system, could be helpful to start with and also physical movement. Many teachers are still struggling with the English language although some of the young teachers are far ahead and are ready to match with European standard. In seafood sector exchange of teachers, academic / lab staff, and students should have more interaction because seafood production and processing occurs in Asia and consumption and market is there in Europe. Seafood has the highest percent of trading among food items i.e about 37% of the seafood produced, mostly in developing countries, is traded across the countries. Therefore, more common understanding and common methods of analysis, etc. is very important. There is a big gap between Europe and Asia especially for standard of education, laboratory tests, environmental indicators, food safety, and so on.

Number of new/updated courses DEVELOPED

57

Number of new/updated courses RECOGNISED/ACCREDITED

51

Number of new/updated courses IMPLEMENTED/DELIVERED

37

Level of new/updated courses:

- Short cycle
- 1st Cycle (e.g. Bachelor)
- 2nd Cycle (e.g. Master)
- 3rd Cycle (e.g. Doctoral)
- Vocational Education and Training
- Not Applicable

Type of recognition:

- HEI Degree
- National degree
- Multiple Degree
- Joint Degree
- Not Applicable

Volume (in ECTS) of new/updated courses

Total 278 ECTS equivalent, 4-6 ECTS per course.

The new study programme includes:

- Placements/internships for students
- Career orientation service
- Career development measures
- Not Applicable

Number of learners / trainees enrolled (per intake / course delivery)

Type of skills/competence developed:

- Transversal/behavioural skills
- Technical /academic /scientific / research skills
- Linguistic competences
- Not Applicable

% of the new curriculum taught in foreign language of the the total of new curriculum developed by the project

All i.e 100% are taught in English with some explanation in local languages whenever needed

For Training/Mobility Activities

Number of partner country "HEIs' students" trained

224 (not counting double)

Number of partner country "HEIs' academic staff" trained

48 from Thailand, Vietnam and Indonesia

Number of partner country "HEIs' administrative staff" trained

It was mainly for academic staff but at least 13 (1/partner had admin staff) involved in the project

Number of partner country "non-HEI individuals" trained (priv. sector, NGOs, civil servants, etc.)

686

IMPACT AND SUSTAINABILITY

Impact at individual level

Extent of attention given to vulnerable groups

to a small extent

Number of direct beneficiaries in the Partner country(ies) per year: academic staff from HEIs

48 teachers over the period of 3(+1) years

Number of direct beneficiaries in the PCs (/year): administrative staff from HEIs

0

Number of direct beneficiaries in the PCs (/year): HE students

100

Number of direct beneficiaries in the PCs (/year): non HE individuals

300

Impact at institutional level

Extent of impact at institutional level: for instance new courses / strategies (policies, regulations) / services (units, centres)

to a high extent

Potential of planned project measures to contribute to new national cooperation activities in the Partner countries HEIs as a result of the project (Memorandum of Understanding /research projects / joint publications /participation in networks or associations etc.)

to a high extent

Potential of project to contribute to new international cooperation activities in the Partner countries HEIs as a result of the project (international agreements / Memorandum of Understanding / research projects / joint publications / participation in networks or associations, etc.)

to a high extent

Impact on the HE Sector

Potential of project to contribute to new (/updated) national or regional policies / laws / regulations in HE

to a high extent

Potential of project to contribute to the establishment (/ further development) of external bodies (/associations /agencies)

to a small extent

Potential of project to contribute to improve the excellence / competitiveness / attractiveness of the Higher Education institutions

to a very high extent

Innovative character of the planned results (i.e. the courses developed; the new tools, services, procedures delivered; the strategies implemented for reaching the target groups; etc.)

to a high extent

Impact on the society as a whole

Potential of the project to pay particular attention to least developed countries

to a very high extent

Potential of the project to engage Partner Countries HEIs in new means of cooperation with employers and other stakeholders (e.g. NGOs, associations, etc.)

to a very high extent

Measures contributing to improving lifelong learning approaches in the Partner Country HEIs

to a high extent

Sustainability

Institutional support for Partner Country HEIs to sustain project results

to a very high extent

Measures to collect Sources of financial (/logistic) support for sustaining the project results from:

- Partner HEIs
- Public authorities in Partner countries
- NGOs
- Private sector
- European Union
- Other

Not Applicable

QUALITY OF PARTNERSHIP & COOPERATION

Involvement of students in the project implementation

to a high extent

Involvement of non-educational stakeholders in the project implementation

to a high extent

RELEVANCE in relation to project objectives

To what extent the project contributes to the policy objectives of the Partner Countries

to a very high extent

Project potential to promote EU's horizontal policies

- Agriculture, fisheries and foods
- Business
- Climate action
- Cross-cutting policies
- Culture, education and youth
- Economy, finance and tax
- Employment and social rights
- Energy and natural resources
- Environment, consumers and health
- External relations and foreign affairs
- Justice, home affairs and citizens' rights
- Regions and local development
- Science and technology
- Transport and travel
- Not Applicable

Training and Mobilities

Training and Mobilities

Training and Mobilities								
Event	Purpose	Type of participants	Gender	Number of participants	Country of Origin	Country of destination	Duration (in weeks)	%compared to objectives
3	Training	Academic staff – teaching	Number Male	1	Thailand	Indonesia	1	10
3	Training	Academic staff – teaching	Number Male	1	Greece	Indonesia	1	10
1	Training	Academic staff – teaching	Number Male	1	United Kingdom	Indonesia	1	100
2	Training	Academic staff – teaching	Number Female	6	Vietnam	Vietnam	1	100
2	Training	Academic staff – teaching	Number Male	1	Thailand	Vietnam	1	100
2	Training	Academic staff – teaching	Number Female	1	Greece	Vietnam	1	100
2	Training	Academic staff – teaching	Number Male	3	Greece	Vietnam	1	100
2	Training	Academic staff – teaching	Number Female	1	Norway	Vietnam	1	100
2	Training	Academic staff – teaching	Number Male	1	Norway	Vietnam	1	100
2	Training	Academic staff – teaching	Number Male	1	United Kingdom	Vietnam	1	100
1	Training	Academic staff – teaching	Number Female	5	Thailand	Thailand	1	100
1	Training	Academic staff – teaching	Number Male	4	Thailand	Thailand	1	100
1	Training	Academic staff – teaching	Number Female	1	Norway	Thailand	1	100
1	Training	Academic staff – teaching	Number Male	1	Norway	Thailand	1	100
1	Training	Academic staff – teaching	Number Female	2	United Kingdom	Thailand	1	100
1	Training	Academic staff – teaching	Number Male	3	Greece	Thailand	1	100

Budget

Costs

Item	Contractual	Declared
Staff costs	378 332,00	416 159,00
Travel and subsistence	123 140,00	98 355,00
Costs of stay	151 440,00	95 640,00
Equipment	261 944,10	219 486,91
Subcontracting	84 700,00	82 880,45
Additional grant for special mobility strand	0,00	0,00
Total:	999 556,10	912 521,36

Income

Item	Contractual	Declared
A – EU Grant requested for the project activities	999 556,10	912 521,36
B – Additional grant for special mobility strand	0,00	0,00
Total:	999 556,10	912 521,36

Attachments

Type of File	Name of the File
Table of achieved/planned results	585924-SSNS-annex_c_table_of_achieved_results.pdf
Declaration of honour (including Check-list)	585924_annex_b_declaration_honor_for_SSNS-AIT2.pdf
SMS report	
CBHE 2017 – Annex VI - Financial Statements (Excel file)	585924_cbhe_2017_-_annex_vi_-_financial_statements-SSNS-#585924-Final-2.xlsm
Final Financial Statement	585924_cbhe_2017_-_annex_vi_-_financial_statements-SSNS-#585924-Final2.pdf
Audit Certificate	Email-about-Auditing.pdf
Reporting COVID Costs	SSNS-Reporting-table-for-unit-costs-Covid-19.xlsx