



AsiFood and its output and prospects: An Erasmus+ project on capacity building in food safety and quality for South-East Asia

A.K. Anal^{a,*}, Y. Waché^{b,c}, V. Louzier^{b,d}, R. Laurent^e, F. Mens^f, S. Avallone^g,
W. Mahakarnchanakul^h, P. Udompijitkul^h, C. Tantikittiⁱ, T.B.T. Nguyen^j, P.P. Thao^j,
T.M.T. Nguyen^k, H.M.X. Nguyen^l, K. Thong^m, H. Seinghengⁿ, G. Schleining^o, L.F. Linder^o,
M.-L. Scippo^p, A. Guidi^q

^a Asian Institute of Technology, Bangkok, Thailand

^b Agreenium, Paris, France

^c International Joint Laboratory, Tropical Bioresources & Biotechnology, Univ. Bourgogne Franche-Comté, AgroSup Dijon, PAM UMR A 02.102 and School of Biotechnology and Food Technology, Hanoi University of Science and Technology, Dijon, France

^d APCSe, Agressions Pulmonaire et Cardiovasculaire Dans le Sepsis, VetAgro Sup – Campus Vétérinaire de Lyon, Marcy L'Etoile, France

^e Montpellier SupAgro, Montpellier, France

^f Foodsynergie, Montpellier, France

^g QualiSud, Univ Montpellier, CIRAD, Montpellier SupAgro, Université D'Avignon, Université de La Réunion, Montpellier, France

^h Kasetsart University, Bangkok, Thailand

ⁱ Prince of Songkla University, Songkla, Thailand

^j Vietnam National University of Agriculture, Hanoi, Viet Nam

^k Hanoi University of Science and Technology, Hanoi, Viet Nam

^l Nong Lam University, Ho Chi Minh City, Viet Nam

^m Royal University of Agriculture, Phnom Penh, Cambodia

ⁿ Institute of Technology of Cambodia, Phnom Penh, Cambodia

^o BOKU - Universitaet Fuer Bodenkultur, Vienna, Austria

^p Université de Liège, Liège, Belgium

^q University of Pisa, Pisa, Italy

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ABSTRACT

The AsiFood project is a capacity building project in the field of higher education involving collaboration among thirteen partners from Cambodia, Thailand, Vietnam, Austria, Belgium, Italy and France. This project aimed to support the universities in Vietnam, Thailand and Cambodia in building their capacities and their link with professionals in food safety and food quality, in the context of ASEAN integration. Further, training for trainers around a key theme, 'food safety and quality' for partner countries was set up involving students and teachers, professional stakeholders, political decision-makers and association leaders. During the first year of the project, study and diagnostic phase were carried out to properly assess the training as per each university needs. In the second year, the training paths around three axes: courses, quality and laboratory analysis were conducted. Finally, a test phase was carried out with the partners by inserting the modules created in the bachelor's and master's degree courses offered by the universities as well as short term trainings on innovations in food safety and quality.

1. Introduction

The foodborne epidemics caused by contaminated food impose a threat to public health. The foodborne disease is prevalent worldwide leading to morbidity and mortality of the patient in both developed and developing countries (Chanseyha, Sadiq, Cho, & Anal, 2018). Globally,

consumption of contaminated food cause sickness in one out of 10 people and the highest burden of foodborne disease is carried by Africa followed by Southeast Asia (Bisholo, Ghuman, & Haffeejee, 2018). Annually more than 600,000 children death is reported in the Southeast Asia region due to the consumption of unsafe food (Odeyemi, 2016). In developing countries, *Escherichia coli* and *Salmonella spp.* are the

* Corresponding author. Department of Food Agriculture and Bioresources, Asian Institute of Technology, Pathum Thani, 12120, Thailand.

E-mail addresses: anilkumar@ait.asia, anil.anal@gmail.com, anilkumar@ait.ac.th (A.K. Anal).

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common pathogens responsible for food poisoning and food-related infections (Akbar et al., 2014).

In Asia, several cases of outbreaks of food-epidemics have been reported such as salmonellosis from fermented products (Nanosombat & Wimuttigol, 2012), Ebola-Reston virus in pigs (Marsh et al., 2011); chemical contaminations of infant milk formula with melamine in China (Havelaar et al., 2015). The reasons behind a foodborne outbreak are found at the different levels in the food chain, from farming to food processing units, to retailers. On the other hand, the demand for food is rapidly increasing and with the current population growth rate, the world population is estimated to be about 9.4–10 billion by 2050. With the increase in demand, the excessive usages of fertilizers, pesticides, insecticides and/or other chemicals are common in practice. In turn, the agrochemical residues in the environment significantly contaminated the food chains (Silveira & Carvalho, 2016). There is a need to address food safety and quality issues in order to cope up the business changing from local markets to globalization. However, confidence in safety and quality is decreasing with the increasing distance between producers and consumers. The increase in the production scale has led to an increase in food safety outbreak (Wache et al., 2018).

Association of Southeast Asian Nations (ASEAN) integration program has prioritized food safety among its top twelve priorities. The principles of ASEAN Food Safety Policy aim to provide the guidelines and facilitate the development of sustainable and robust food safety regulatory framework for the ASEAN region. Among 10 core principles of the ASEAN Food Safety Policy, reliable traceability system principle serves the ASEAN Member States to identify at any relevant stage of the food chain and swift withdrawal of unsafe food products. This principle enables ASEAN Member State to establish a national food recall system to prevent unsafe food products from reaching the consumer (The ASEAN Secretariat, 2016). In Vietnam, the National Strategy on Food Safety Strategy (2011–2020) has been approved to encourage food safety (APEC, 2017).

Traceability, a component of a food safety management system, is defined as the ability to track the movement of food through specified stages of production, processing and distribution. In the food system, traceability is used as an important tool to deal with food safety and quality assurance issues, therefore leading to risk prevention. In the food business, traceability records are used as proof of compliance to food safety, bio-security and regulatory requirements. Thus, it is imperative that the traceability of food products be strengthened to support food safety worldwide (Southeast Asian Fisheries Development Center, 2017).

Along with the need of national legislation on food safety at the top of the ASEAN's priorities, there are also other criteria that need to be considered, for example, training in production processes and marketing, the development of human resources, monitoring, etc. Although these actions have been identified by ASEAN member countries, the standard of monitoring and the effectiveness of regulation enforcement diverges within the ASEAN. It is, therefore imperative that a common understanding of food safety issues emerges among the major Asian food export countries in order to prevent potential problems and introduce effective regulations.

Concerning the public health problems, raw materials and food unfit for human consumption and inadequate quality management systems not only affect the local market but also the international market. Small and medium-sized food processing companies are facing problems adapting food safety requirements and food quality management systems in order to export their products. Furthermore, a large percentage of the population in Asian countries are involved in farming. But the income of farmers remains low and unpredictable due to uncertainties regarding the quality of their produce. Most of the food safety and quality problems are due to qualitative and quantitative limitations regarding food safety management. The main problems that exist are due to a variable standard of staff expertise, with most staff failing to work in compliance with the rules defined by specialist

training for their field, and who, in many cases, have not even had the opportunity to do professional training. Furthermore, inspection authorities are few and far between and generally inadequate in Asian countries. In addition, most training courses that are on offer in the professional world and in higher education are not adapted to meeting the needs and expectations of professional stakeholders. The recent study by the Department for Higher Education, Cambodia has highlighted a clear lack of human resources in training needs identification and course design, especially in the fields of food processing, agriculture, and food safety.

The AsiFood Project aims to tackle the issues related to food safety by training target groups ranging from students (undergraduates and graduates) to professional stakeholders in both private enterprises and public bodies. This Project also highlights the issues to manage food safety within the framework of a global strategy for the food supply chain. Also, in accordance with the objectives defined by the ASEAN in 2015, the Project is a direct response to the need to harmonize a regional, or even national, approach to food safety management, by recommending the adoption of international standards and by implementing training in higher education institute (HEIs) and enterprises for international managers. AsiFood projects thus aim to improve the relationship between HEIs and professional stakeholders by identifying the gaps and integration of the required skilled professionals. The development of modules and training programs would lead to more useful and effective educational and research programs towards the need of food-based industries. To this end, the AsiFood Project can be considered as an academic program as well as a capacity building project to be promoted in HEIs, enterprises (especially SMEs) and ASEAN organizations and agencies in a network structure linked to enterprises and European agencies.

2. AsiFood project

AsiFood (October 2015–October 2018), a three years project funded by Erasmus + Program, European Commission was a capacity building project in the field of higher education involving thirteen partners from Cambodia, Thailand, Vietnam, Austria, Belgium, Italy and France. The consortium was made up of a group of institutions that have been working together for several years in the field of training and research. These institutions have led several multilateral research projects on food safety, (ASD- INSALINS, a joint laboratory between Agreenium and HUST), national research programmes (ANR-REvalter) as well as European (MONIQA, ASIALINK, FOODSEG) and international (MONIQA, ASIALINK, FOODSEG) research programmes. The partners of consortium are:

1. The National Institute of Further Education in Agricultural Science – Montpellier SupAgro (SupAgro), France
2. The Agreenium Institute, France
3. BOKU, (Universität für Bodenkultur), Vienna, Austria
4. The Universit of Liège (ULg), Liège, Belgium
5. The University of Pisa (UNIPI), Pisa Italy
6. The Cambodian Institute of Technology (ITC), Thailand
7. The Royal University of Agriculture (RUA), Cambodia
8. The Asian Institute of Technology (AIT), Thailand
9. Kasetsart University (KU), Thailand
10. The Prince of Songkla University (PSU), Thailand
11. Hanoi University of Science and Technology (HUST), Vietnam
12. Nong Lam University (NLU), Vietnam
13. The Vietnam National University of Agriculture (VNUA), Vietnam.

In the field of training, the cooperation involved training professionals in Europe (BOKU, ULg, Agreenium, and UNIPI with the Chinese-Italian Centre for Food Safety) as well as creating bilateral master's degree courses in Asia. One such master's degree course is the master's degree in "Food Technology" run by VNUA and ULg, in which ITC,

HUST, and RUA are also involved. This Master's degree course is an initial response to meet urgent training needs in this area. Following the remarkable interest and needs expressed by some Asian universities, Agreemium made an exploratory mission in Asia in 2014 to visit the HEIs, national agencies and some of the food processing plants to identify the needs and to build a strategy that would meet this demand. Montpellier SupAgro, France played a crucial role in formulating the AsiFood Project.

The Asifood Project has identified the lack of close relationships between Asian HEIs and professional stakeholders nationally. This indicates that the expectations of stakeholders are not met by training courses and curricula so that ultimately the graduates present on the job market do not have the required level of skills. In general, the aims of the Asifood Project were:

- I. To enhance the relationship between HEIs and professional stakeholders for the development of effective educational and research programs, participation of professional stakeholders on HEI boards and in teaching courses, and joint supervision of student work placement.
- II. To use the training needs identifications and course design methodology with partner HEIs to ensure that new and/or revised syllabuses are adapted to the needs and expectation of professional stakeholders.
- III. To improve teaching staff 's knowledge and skills with the introduction of new teaching tools, resources and methods and the creation, implementation, and dissemination of three multi-disciplinary training modules on food safety and food quality management
- IV. To strengthen the relationships between the HEIs of the ASEAN, as well as between Asian and European HEIs in the field of food safety and food quality management.

3. Project management methods and key events

3.1. Work packages and responsibilities

Montpellier SupAgro, France as a project coordinator was involved in teacher training, the development of training modules, the creation of E-learning modules, and coordination and the overall management of the AsiFood Project. The activities of the AsiFood Project were all defined using the "Upstream" training needs identification and course design method illustrated as in Fig. 1. The AsiFood Project was divided into eight Work Packages (WP), each of which was managed by an academic partner and a member of the consortium designated on their experience and skills. Among the 8 WPs, three WPs were assigned for the project preparation (WP1), project management (WP8) and quality control management (WP7) and remaining five WPs focused on the technical aspects of the project such as development of the relationships between professional stakeholders and HEIs (WP2 and WP5), development of courses and syllabuses related to food safety and quality

management adapted to the needs and expectations expressed by professional stakeholders (WP3 and WP4), and dissemination of project results to other higher education institutions of the ASEAN and other region in Asia (WP6).

3.1.1. WP1: preparation

During the first Steering Committee (SC1) in March 2016, staff in charge of the key project activities were designated and the work and communication strategy for the project was agreed. The partners received training in the financial and administrative procedures and regulations specific to Erasmus + funded programs.

3.1.2. WP2 and WP5: development of relationships with professional stakeholders

WP2 and WP5 performed under two different phases. Initially, in order to understand the existing relationship between the HEIs and professional stakeholders, a survey was conducted among at least 160 professional stakeholders from Cambodia, Thailand, and Vietnam. The strategy and questionnaires for the survey were developed jointly by the consortium partners. The findings of the survey were then presented to different professional stakeholders. A workshop on "Change Management" was also organized for the Institute Heads from each university partner to develop the required syllabuses that suit the needs and expectations of professional stakeholders and achieves graduate employability.

After the second Steering Committee meeting (SC2), the WP5 work plan was carried out. The activities that were to be covered were planned out in advance, namely the production of surveys related to work placements, the improvement of practices related to work placements and a seminar to share experiences about job/recruitment forums and work placement practices.

WP3 and WP4: Development and modernization of teaching syllabuses related to food safety and food quality.

The WP3 activities aimed to enable partner universities to build the required skills in food safety and food quality monitoring by means of a participative approach, and then by making recommendations for course syllabuses (activity 3.6). Above all, the objective was also to apply a methodology that would achieve training needs identification and course design. The AsiFood Project proposed to create three training modules. The fields of study that were initially identified during the proposal writing period are:

- I. Food safety and quality management upstream of the food supply chain
- II. Food safety and food quality analysis
- III. Food safety and food quality in a food processing plant

The syllabuses of the modules were defined in greater detail by three Working Groups composed of four experts, identified among the consortium partners either belonging from Europe and South East Asia. The conditions for the transfer of credits awarded for these modules

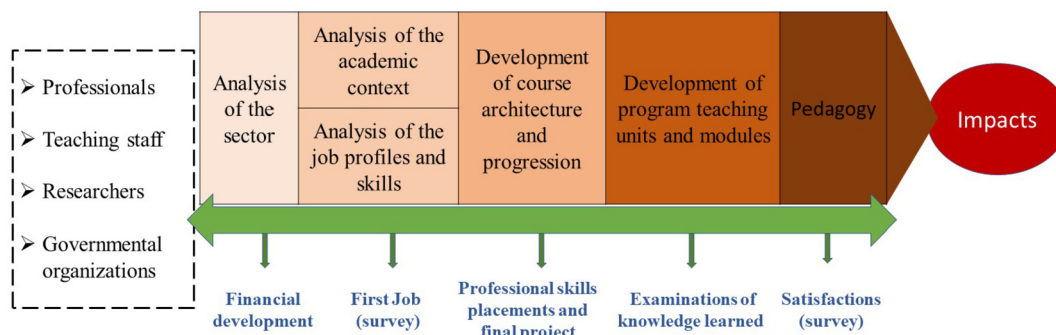


Fig. 1. Illustration of the activities of the AsiFood Project.

between partner HEIs were determined after the validation of the modules and syllabuses by each partner university and the integration of the modules into existing or newly created master's degree courses. The teachers from the South East Asian countries were trained and exposed to the technical aspects as well as new teaching methods in Europe. Similarly, various instruments were purchased in relation to enhancing the laboratories of southeast Asian HEIs.

3.1.3. WP6: programme promotion and sustainability

The three training modules termed as short technical training course (STTC) was developed, taught and evaluated at least once by every South East Asian HEIs. One of the STTCs was made an E-learning module and two other online training modules were created for teaching tools and on training needs identification and course design.

3.2. Project monitoring and decision making

For project management and the monitoring of activities the AsiFood Project was organized as:

- i. A Steering Committee (SC) meetings
- ii. Working Groups with specific responsibility and activities related to Work Packages.
- iii. Group of people responsible for reviewing the Work Package documents with the framework of work on quality control management conducted by WP7.

Four Steering Committee meeting along with on-line meeting once or twice monthly was organized over the course of the AsiFood Project. These meetings were conducted with the participation of at least one member from each Asian HEI. The meetings were highly productive for all the participants due to an opportunity to share the outcomes as well as an enquiry about the future steps. The Project Manager systematically made a point of reminding the participants of the overall vision of the AsiFood Project and its expected outcomes.

3.3. Quality control management of the AsiFood project

Within the framework of WP7, BOKU was intended to conduct the quality control management of the AsiFood Project. The ISEKI-Food Association also intervened in staff training to design the modules and to check that the proposed modules compiled with EQAS requirement. The interval evaluation of the project was conducted by the beneficiaries of the AsiFood Project, course syllabuses were evaluated by master's degree students, and teaching skills of the trainers were evaluated by the professional stakeholders participated in the short technical training course.

4. AsiFood project specific objectives and outcomes

The AsiFood Project aims to assist HEIs in Vietnam, Thailand, and Cambodia in capacity building and enhancing their relationships with

food safety and food quality professional stakeholders. The Project intervenes within the context of these countries being currently involved in integrating the ASEAN. The specific objectives and their outcome of the AsiFood Project are:

4.1. Specific objective 1: to develop and improve relationships between HEIs and professional stakeholders in the food processing industry

Outcome: The lecturer-researchers for the AsiFood Project managed activities like meetings with professional stakeholders to conduct surveys; proposal, promotion and organization of short technical training courses (STTCs); use and promotion of the training needs identification and course design method within the HEIs; and help in organizing job/recruitment forums for students on Master's degree programmes with the offices already in charge of this sort of event.

The HEIs organized a first survey targeting HEIs and professional stakeholders. In total, 160 enterprises took part in the surveys to ascertain the relationships that existed between HEIs and professional stakeholders (44 enterprises and 20 HEIs in Thailand, 17 enterprises and eight HEIs in Cambodia and 51 enterprises and 20 HEIs in Vietnam). All the HEIs held feedback meetings to review the results obtained from their partners.

Some partner HEIs are used to organizing job/recruitment forums on a yearly basis or twice per year, while some HEIs organized a special event particularly aimed at undergraduates and master's degree programs graduates for the very first time as a part of the AsiFood Project. Up until then, it was more frequent that job/recruitment forums were organized across the whole university covering all subjects and both bachelor's and master's degree courses. The current trend among master's degree programs is that demand outweighs supply. It is important to underline that the profile of graduates recruited by enterprises after a bachelor's degree is generally well-suited to the needs and expectations of professional stakeholders. Consequently, they often enroll in master's degree course as part of their vocational training, while remaining employed by their company in the food processing sector. In Asian university faculties, this is known to be the case for more than half of the students on master's degrees courses. The aim of the AsiFood Project was not to replace existing HEI proposals, but rather to bolster or complete their offer made available at faculties or schools in order to help master's degree students find work placements or employment.

For some HEIs, the number of students enrolling on master's degree programs has been in decline for some years. Each HEI proposed one short technical training course (STTC) (Table 1) that was aimed at students and professional stakeholders.

4.2. Specific objective 2: to improve the capacity of partner universities to develop new syllabuses adapted to the needs and expectations of professional stakeholders in the current economic context

A second survey was conducted among 134 professional stakeholders, enterprises, academic institutions on their needs and expectations in terms of graduate skills. This survey was created jointly by the

Table 1

The short technical training courses (STTCs) taught at a partner university.

Higher Education Institute	STTC aimed at professional stakeholders
The Asian Institute of Technology (AIT), Thailand Kasetsart University (KU), Thailand	- Food quality and safety in innovative production system - Food safety standard and GMP
The Prince of Songkala University (PSU), Thailand The Cambodian Institute of Technology (ITC), Cambodia The Royal University of Agriculture (RUA), Cambodia The Vietnam National Institute of Agriculture (VNUA), Vietnam Hanoi University of Science and Technology (HUST), Vietnam Nong Lam University (NLU), Vietnam	- Good hygienic practice in food services and the basic food safety management - Food safety for small holders of retailers - Training workshop on Food safety and quality for SMEs - Quality and food safety management - Innovation in food safety management - Quality assurance and food safety - Food quality management for food processing plant

partners of the consortium. The survey results were recorded using google forms. The aims of this second survey were:

- To obtain and analyze the needs and expectations of professional stakeholders and the skills associated with master's degrees and future graduates.
- To obtain and analyze the needs and expectations of professional stakeholders and the needs and potential of the business sector.

Furthermore, WP3 analyzed the existing training offers (in education and research) and this work subsequently enabled each HEI to create new courses to incorporate into their existing training offers.

The lecturers/teachers from consortium partner institutions of South East Asia were provided technical and different teaching tools as well as exposure visits to various well-organized farms and processing industries in Europe. This included field trips to visit research centers, research and/or analysis laboratories, food processing plants and farms. These visits served several purposes:

- I. To improve participants' knowledge on subjects covered by the training modules
- II. To discover measures currently in use in production, control, and transformation in Europe
- III. To enhance partner universities' networks with researchers from host laboratories
- IV. To strengthen the relationships between partner universities and HEI research laboratories.

Specific Objective 3: To improve relationships between Asian higher education institutions and between Asian and European HEIs to work on food safety and food quality.

The following three modules were designed based on information that emerged during the preparatory stage of the AsiFood Project:

- a. Food Safety and Quality in Primary Production
- b. Food Safety and Quality - Laboratory Management and Analysis Techniques
- c. Food Safety and Quality in the Food Processing Industry

The underlying aim was to study the concepts of food safety and food quality across the primary food production process from farm to fork. Lecturer-researchers developed the syllabuses of each module based on the results of two surveys targeted at professional stakeholders to know the skills required of graduates. The surveys were conducted in close relationship with European lecturer-researchers. Depending on the situation of each HEI, the modules were either partially integrated into existing training courses or they were used in full. An example is the launch of a new master's degree course by the RUA. To do so, workshops were organized as well as specific meetings for each module and discussions were organized via Skype.

Lecturer-researchers from each partner HEI consulted European researchers in-depth as well as lecturer-researchers from each partner country. The modules that were developed were either partially integrated incorporated into existing master's degree courses or used to create completely new ones. Three modules were developed, and each module was divided into several sequences making it easier to partially integrate them into existing training offers. The course framework which served as the basis for the presentations of the modules was recommended by the ISEKI Food Association as part of the EQUAS certification process.

4.3. Specific objective 4: to improve relationships between Asian higher education institutions and between Asian and European HEIs to work on food safety and food quality

Each seminar and workshop organized during the AsiFood Project

was an ideal opportunity for participants to exchange ideas, to get to know the partner institutions and their organization and to build their networks. The lecturer-researchers who were involved in the AsiFood Project could learn about each other's activities and specialties and, often for the very first time, they had the opportunity to visit the various partner universities. For some HEIs, these meetings have triggered off the launch of an official collaborative process aimed at developing student and staff mobility.

5. Key outcomes of the AsiFood projects

The partner universities of AsiFood Project over a period of 3 years have encountered some challenges such as (i) the cultural and language gap between Asian and European partners; (ii) certain disparity in the courses proposed by different partner HEIs and at different levels such as variations at institutional organizations, use of pedagogical methods, availability of resources, tools etc. and (iii) the time needs for the validation process of modules and trainings. However, with the completion of AsiFood Project course, confirmation of the achievement of the main objectives of the project have been made. Several outcomes directly related to the AsiFood Project objectives were planned and achieved including:

- Revision of the existing Master's degree syllabuses or creation of new Master's degree courses based on the three training modules has been done by all the partner universities.
- Positive feedback from both lecturer-researchers and students have been received.
- 154 students have already benefitted from these courses.
- Relationship between Asian universities and also Asian universities and European partners have been strengthened.
- Plans for staff mobility among the partner universities have been set up.
- At least 2 conventions have been officially formalized and others have been agreed on an informal basis.
- The relationships between HEIs and professional stakeholders in the food processing industry have been strengthened.
- All the partner universities have purchased equipment to improve the range of training opportunities and to prepare graduate students for their future careers.
- The training courses organized in European universities have been extremely beneficial for the trainees.
- The E-learning module on "Training Engineering" is available in English and French language.
- A set of online teaching methods and tools are available.

Besides these, some of the unexpected outcomes exceeding the AsiFood Project's initial expectations were achieved such as.

- An International Scientific Conference was organized jointly with South East Asia Academy for Beverage Technology (SEA-ABT) and Integrating Food Science and Engineering Knowledge Into the Food Chain (ISEKI)- Food Association for dissemination and scientific networking purpose. The conference was attended by over 40 researchers from Europe, Thailand, Vietnam, Cambodia, Philippines, India, Indonesia and some stakeholders from Thailand and policy-makers.
- The AsiFood Consortium is currently preparing to build a new HEI capacity building project within the framework of the Erasmus+ 2019 call for proposals.

6. Conclusion

The AsiFood Project has, planted quite a few seeds and launched some interesting processes in all of the institutions that have been involved. More importantly, the tangible and concrete outcomes of the

AsiFood Project are proof of its success and tend to promise its development in the future. The Master's degree courses and the training modules work and are currently in use. The training equipment is already in use and plays an important part in providing students with training that prepares them for the needs and expectations of the job market. However, the AsiFood Project has achieved much more than technical or practical advances. Over the course of the last three years, the Project and the work carried out has been characterized by an open spirit and willingness by all to share experiences. One of the most important impacts of the AsiFood Project is, of course, the enhanced cooperation between HEIs both at nationally and internationally and that is true for all the partner universities in the ASEAN and also in Europe, and this for both education and research. Lecturer-researchers and staff from all the participating countries felt that they belonged to one large community and strove together to achieve a common goal, readily shared experiences and knowledge, while constantly managing and enjoying the complexity of working in an intercultural and international environment.

This three-year AsiFood Project has had its fair share of challenges, outcomes and opportunities and as this adventure draws to an end, we can cast a confident eye on the future. We know that we have succeeded in launching different forms of sustainable processes and this for years to come. What is more, as announced at the final Steering Committee meeting, the AsiFood Project partners would like to continue enhancing the proposal and pursue their work together. It was agreed that the Consortium would develop a new project proposal on food safety and but one that also widens its scope to include food safety and food quality, nutrition, food loss and wastage, sustainable development, etc. and that strengthens the vocational training made available to professional stakeholders in response to their immediate and urgent needs and expectations.

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