SAFEGRO

FOOD SAFETY CURRICULUM FINAL REPORT

Hanoi December 2023

Recipients:

Sending place:

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LIST OF ABBREVIATIONS

ASEAN	The Association of Southeast Asian Nations
CPTPP	The Comprehensive and Progressive Agreement for Trans-Pacific Partnership
Crds	Credits
ELO	Expected learning outcome
EVFTA	The European Union and Vietnam signed a Trade Agreement
HUST	Hanoi University of Science and Technology
NLU	Nong lam University (Ho Chi Minh City University of Agriculture and Forestry)
PLO	Program learining outcome
VNUA	Vietnam National University of Agriculture

About the project

Funded by Global Affairs Canada, our project seeks to enhance the Vietnamese people (Ha Noi & Ho Chi Minh city) access to safe and competitive agri-food products, with an aim to improve the well-being of consumers as well as other agri-food actors. SAFEGRO project is implemented by Alinea International in partnership with the University of Guelph.

Food safety is a major public health concern. Many people do not trust food safety enforcement at informal markets where they buy most of their food. Trade for Vietnam's commodity exports also suffers due to a lack of compliance with international standards.

SAFEGRO project works with national and municipal governments to modernize food safety capacity among regulators, thousands of smallholder farmers, cooperatives, processors, retailers and consumers along specific meat and vegetables value chains in Ha Noi and Ho Chi Minh city. SAFEGRO supports Vietnam's Ministry of Agriculture and Rural Development, Ministry of Health and Ministry of Industry and Trade jointly.

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EXECUTIVE SUMMARY

Revised working plan

Brief report of the activities carried out for the package of *International Food Safety Curriculum Development* in the framework of Safegro project.

No	Content	Expected results	Result
1	Develop a team plan with national and international experts - Selection of participating universities - Agree on orientation of activities - Develop detailed action plans	- Plan - List of Universities	Done
2	Mapping of current training programs on food safety in some universities in Vietnam (characterization analysis, comparison of similarities/differences, points out advantages/ disadvantages)	Mapping curricula	Done
2a	Constructing Survey Questionnaires of ELO	Questionnaires	Done
3	Organize surveys to know the needs and expectations of stakeholders (state management agencies, universities, research institutes, enterprises ...) on the expected learning outcomes and the undergraduate curriculum in food safety (60 units/individuals)	- List of surveyors - Survey data collection - FAO and STC will perform the surveys with analysis done by the FAO/STC team, Analysis report	Done
4	Organize a stakeholder consultation workshop on FS programs to go over the expected learning outcomes and the results of the FAO/STC surveys. Consultations with MoET/MARD for their input.	- Workshop Program - Technical and scientific Presentations	Done
5	After the stakeholder consultation, revise, update and unify the learning outcomes for the Universities training program on food safety according to the standards of Vietnam and in harmony with FAO	ELOs revised updated	Done
6	Draft of a model curriculum customized for selected universities	Curricula	Done
7	Finalize the model curriculum and develop a curriculum alignment matrix to check if the	Matrix of Curriculum	Done

No	Content	Expected results	Result
	planned courses cover the overall learning outcomes for the program		
8	Develop course descriptions and learning outcomes for each course selected for the model curriculum	Expand course descriptions (with stakeholder engagement)	Done
9	Finalise the midterm report with attachment of curriculum and course description for generic training curriculum on food safety for Vietnam	Mid-term report (extra work)	Done
10	Develop curriculum and courses' description.	Courses descriptions	Done
11	Final report	Report	Done

Initial working plan

STT No	Nội dung Content	Kết quả cần đạt Expected results	Thời gian dự kiến Deadline
1	Develop a team plan with national and international experts - Selection of participating universities - Agree on orientation of activities - Develop detailed action plans	Plan List of Uni	Nov 2022
2	Mapping of curent training programs on food safety in some universities in Vietnam (characterization analysis, comparison of similarities/differences, points out advantages/disadvantages)	Mapping curricula	Dec 2022
2a	ELO Survey	Questionnaires Survey data Datta Analysis (Project)	
3	Organize surveys to know the needs and expectations of stakeholders (state management agencies, universities, research institutes, enterprises ...) on the expected learning outcomes and the undergraduate curriculum in food safety (60 units/individuals)	Questionnaires List of surveyors Survey data collection FAO and STC will perform the surveys	Dec 2022

		with analysis done by the FAO/STC team, Analysis report	
4	Organize a stakeholder consultation workshop on FS programs to go over the expected learning outcomes and the results of the FAO/STC surveys. Consultations with MoET/MARD for their input.	Program Technical and scientific Presentations	10-15/Dec 2022 Or 26 Fev-03 March 2023
5	After the stakeholder consultation, revise, update and unify the learning outcomes for the Universities training program on food safety according to the standards of Vietnam and in harmony with FAO	ELOs revised updated	Jan 2023 (adjust July 2023
6	Draft of a model curriculum customized for selected universities	Curicula	Jan 2023 (adjust Sept 2023)
7	Finalize the model curriculum and develop a curriculum alignment matrix to check if the planned courses cover the overall learning outcomes for the program	Matrix of KAP	Feb 2023 (adjust Oct 2023)
8	Develop course descriptions and learning outcomes for each course selected for the model curriculum	Ellaboration of courses descriptions (Need participation of all members of Faculties)	April 2023 (adjust Nov 2023)
9	Finalise the report with attachment of curriculum and course description for generic training curriculum on food safety for Vietnam	**Final report**	May 2023 (adjust Jan 2024)
10	Develop syllabus meet ELOs, curuculum and courses' description.	Course descriptions Syllabus	July 2023
11	Evaluate the effectiveness of the program developed.	Trial teaching one module in the training program at each University	Sep 2023 – Aug 2025

1 Introduction

1.1 Introduction

The overall task is to support the development/revision of an undergraduate food safety curriculum (Bachelor or Engineer) to be adapted and adopted by at least two among HUST, VNUA, NLU +2 universities in Vietnam identified as stakeholders in the SAFEGRO project.

The curriculum will be informed by the international food safety curriculum and syllabus developed by the International Union of Food Science and Technology (IUFoST), FAO and other international organizations currently undertaking similar work related to piloting international food safety curriculum. Activity will engage with key institutions in Vietnam to develop a generic curriculum to be endorsed by the Ministry of Education and eventually adopted by those universities interested in promoting food safety programming.

The consultant team will promote the development/revision of the curriculum/module, syllabus and associated educational materials, including on-line content. Where possible, existing materials and content will be adopted and adapted from existing curriculum from recognized international institutions. For which the University of Guelph will take the lead.

1.2 Objectives

The objectives of this report were to:

1. Provide an evidence-based assessment of expected program learning outcomces (PLOs) of Food Safety and Quality Management training program (FSQM) in Vietnam.

2. Solicit opinions from stakeholders within the food industry regarding the body of knowledge associated with Quality Management and Food Safety (17 subjects) in the Bachelor/Engineer training program in Food Engineering/ Food Technology/ Food Safety Quality Assurance.

3. Construct undergraduate curriculum on Food Safety and Quality Management.

2   Survey methodology

2.1   Overview report
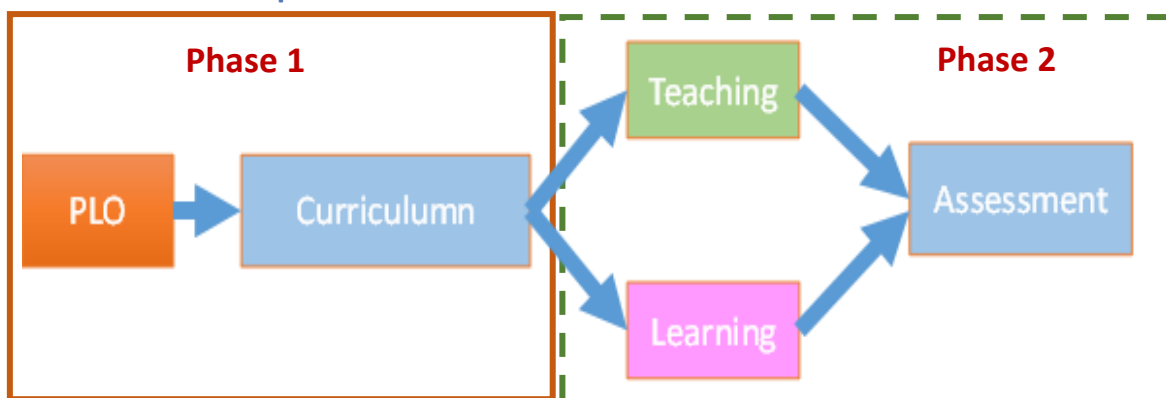
The PLOs has been developed and revised based on HUST, VNUA, NLU 's PLOs comparison and PLO survey. PLO survey is to collect opinions of employers alumni and stakeholder, which describes the knowledge, skills needed for graduated students from QFS program. At the stage of forming the curriculum, a course matrix is built to determine clearly the contribution level of each course to the PLOs. The LO of the course will be then constructed based on the designed course matrix. Each detailed syllabus clearly defines the contribution of the courses to the learning outcomes based on different teaching activities. After a cycle of teaching and learning, assessment will be performed for thenprogram evaluation.

2.2   Implimentation

To assess the expected program learning outcomes (PLOs) of the FSQM training program and program curriculum, a group of domestic and international experts discussed and evaluated the PLOs of related food safety and hygiene training programs at universities in Vietnam and Canada. Then, they compared the training program, discussed, and developed the PLOs. The PLOs were divided into four main groups, including knowledge skills, cognitive skills, practical skills, and interperson skills.

Primary data for the survey were collected through direct interviews and sending questionnaires to stakeholders, including government agencies, universities, research institutes, and companies (small, medium, and large). The structured questionnaire was designed with various sections, including: 1) General information about the stakeholders, such as organizational types, number of employees, production and business characteristics, and human resource needs, and 2) Reference opinions and evaluations based on different skills (Appendix 1).

2.3   Survey content of PLO

ELOs of the FSMS training program are divided into five main parts including knowledge skills, cognitive skills, practical skills, interperson skills and attitudes

(1)Knowledge skills

i. Demonstrate knowledge and understanding of food safety hazards and risks.

ii Demonstrate knowledge and understanding of food chains and food systems.

iii. Demonstrate knowledge and understanding of the practices and principles of food hygiene, health promotion and cleaning and sanitation

iv. Demonstrate knowledge and understanding of food safety standards and regulations.

(2) Cognitive skills

(i) Analyze (Understand) a food system or value chain and assess potential food safety hardzard assessment (for bachelor) and food safety risk assessment (for Engineer with 180 credits).

(ii) Propose tailored solutions (risk management) to food safety problems and challenges, taking into account multiple criteria and factors e such as effectiveness, acceptability, and implementability (risk management).

(iii) Demonstrate skills of critical analysis and review, logical thinking and reasoning, and clear and effective communication.

(3) Practical skills

i. Understand methodology to Choose, design, or deploy tools and approaches to Predict/ Prevent/ Detect/ Assess/ Control/ Respond/ Communicate food safety hazards and risk in food systems.

ii. Be able to solve food safety and quality issues through case studies, project based learning and real specific situation at the enterprise.

(4) Interperson skills

i. Work effectively as part of a team.

ii. Communicate, orally and in writing, effectively individuals, organizations and groups with diverse backgrounds and experiences and perspectives, both in technical and lay terms.

iii. Demonstrate professional integrity, ethics, and respect for gender and cultural diversity.

(5) Attitude

i. Show commitment to the practice and promotion of food safety culture across all professional activities.

ii. Demonstrate a willingness to pursue continuing education to stay appraised of changes in technology, transitions in agricultural systems and emerging food safety threats

2.4   Survey content

The survey encompasses the evaluation of 17 courses within the Bachelor and Engineer's program in Food Engineering/ Food Technology/ Food Safety Quality Assurance

The questionnaire comprises 15 questions organized as follows

- Question 1 relates to the allocation ratio of knowledge within the program curriculum;

- Questions 2-5 pertain to knowledge domains.

- Questions 6-8 address cognitive skills.

- Questions 9-10 focus on practical skills.

- Questions 11-13 explore teamwork skills.

- Questions 14-15 inquire about attitude and behavior.

Based on the questionnaire results, program adjustments will be made to better meet the requirements of the labor market. The estimated time required to complete the questionnaire is 20-25 minutes.

The program is structured based on reference to similar programs both domestically and internationally. Detailed information is presented through the following three appendices:

1. **Appendix 2: Program Outcomes**

- Describes the program outcomes for the undergraduate and engineering programs, emphasizing knowledge, skills, and attitude. Bachelor's Program (120 credits, 3.5 – 4 years, fundamental + specialized knowledge) and Engineer's Program (150-180 credits, 4.5 – 5 years, in-depth technical courses).

- https://docs.google.com/document/d/1zy62V8sOqxI-KnOwmQiMahLGEIlrwurL4-Mo8zaeZo8/edit?usp=sharing

2. **Appendix 3: Training Program curriculum**

- Provides an overview of the training program curriculum, including foundational knowledge and specialized knowledge (mandatory and elective).

- https://docs.google.com/document/d/149CYWx6ysY6nVqZHC4tHMm1TuLBRyaRo0fJopPuOnLw/edit?usp=sharing

3. **Appendix 4: Summary Descriptions of Courses**

- Offers brief descriptions of each course within the program.

- https://docs.google.com/document/d/1wyDzI56ECgQ0RUFjsL3VwmqNuoC66w_61WwGzgwqhSw/edit?usp=sharing

2.5   Data analysis

The collected data were synthesized into Tables and Figures using Excel 2021 software.

3   Results

3.1   BUILDING PROGRAM LEARNING OUTCOME (PLO)

3.1.1   Requirement for program learning outcome

The development of output standards will determine the training program curriculum, detailed outlines of modules, testing and evaluation forms and affect all stages of training.

Output standards need to show the content and training objectives, with the next level detailing and concretizing the content at the previous level. Learning outcomes should include the following requirements, but are not limited to:

- Broad professional knowledge to be able to adapt well to job positions in food safety and quality management

- Professional skills and personal qualities necessary for career success

- Social skills necessary to work effectively in multidisciplinary teams and in an international environment: teamwork and communication skills

- Ability to participate in deploying and testing systems/processes/products/technical technology solutions and capacity to operate/ use/ exploit systems/ processes/ products/ technical technology solutions techniques that meet the requirements of quality management and food safety

3.2   Comparing program learning outcome

3.2.1   Comparing ELOs in term of knowledge, skills and attitudes

Comparing PLOs is carried out based on 04 Food Engineering/Food Technology training programs of Hanoi University of Science and Technology (HUST), Vietnam National University of Agriculture (VNUA), and University of Agriculture and Forestry. Ho Chi Minh City (NLU) related to the Food Safety and Quality Management major.

PLOs	HUST	VNUA	NLU
Knowledge	Understand and apply basic scientific knowledge of biochemistry, microbiology, equipment processes as a foundation for analysis, calculation, product design, technology and production management	Analyze the effects of technical factors in the production line to ensure and improve food product quality. Build production systems, programs and food quality assurance systems according to	Apply the foundation of core technical knowledge in the field of food technology.

PLOs	HUST	VNUA	NLU
	Understand and apply technical knowledge of processing technology and equipment, quality control management, etc. to operate equipment, production lines, product design, technological processes, food factories and Operate production systems.	national and international standards.	
Skill	Skills in conducting experiments and researching issues in food technology Know how to use modern tools and equipment in the working environment. Use English effectively at work, achieve TOEIC ≥ 500.	Build production processes and control food quality from raw materials to finished products.	Test and experiment with solutions to problems related to food preservation, processing and safety
Attitude	Recognize the connection between the field of study and economic, social and environmental factors.	Demonstrate the spirit of entrepreneurship and lifelong learning, social responsibility, professional ethics, and compliance regulations and laws on food production.	Be aware of the roles and responsibilities of an engineer, understand corporate culture, professional ethical standards and know how to work in industrial organizations. Grasp market trends and social contexts affecting food production activities.

Evaluation: Food quality and safety at HUST focuses on the field of food production, processing, preservation and control on an industrial scale through updated advanced techniques/technology/methods. At VNUA, we focus on controlling raw materials, processing technology and techniques, and supply chain management. NLU focuses on core knowledge and technology solutions.

3.2.2 Comparing the knowledge content of bachelor's degree training programs

No	Professional component	HUST (Crds)	VNUA (Crds)	NLU (Crds)
	Total	**132**	**131**	**158**
I	**General Education**	**51**	**41** (1+2+4+IV)	**58**
1	Mathematics and basic sciences	**32**	22	**27**
2	Scocial science and Humanities	13 (in accordance with regulations of Vietnam' MOET)	10	11
3	Physical education/National defense education	-		8
4	English	6 (02 basic English courses)	6	10
II	Enginerring Education	110 hrs	13	-
III	**Basic and Core of Engineering**	48	55	59
IV	**Soft skills**	9 Include of 02 compulsory modules: Social/Start-up/other skill (6) Technical Writing and Presentation (3)	3 Include 2 crds of Introduction to informatics, 1 crd of soft skills	9 Include Specialized English (4), laboratory skills (1), Academic presentation skills (1), Research methodology (3)
V	**Elective Module**	16 In specialization of Food Quality Management	12	16
VI	**Engineering Practicum**	2 Scheduled for third year	3 Intership at company in third year	4 Internship at company
VII	**Bachelor Thesis or Design Project**	6 In specialization of Food Quality Management	10	12

3.2.3 Contribution of the FSQM knowledge block in the training program

▪ The knowledge block related to Quality Management and Food Safety in the Bachelor's and Engineer's degree programs at the Hanoi University of Science and Technology, is situated within the following context:

- Foundation: 48 credits

- Specialization: Includes a dedicated specialization in QM: 16 credits

- Internship and Thesis: 8 to 12 credits

▪ Knowledge Block in the Bachelor's program for FSQM at VNUA

- Foundation: 33 credits

- Specialization: 23 credits (mandatory)

- Internship and Thesis: 23 credits

▪ The knowledge block related to Food Technology in the Engineer's degree program at Nong Lam University, Ho Chi Minh City, is situated within the following context:

- Foundation: 5 credits

- Specialization: 16 credits

- There is no Specialization direction in Quality management.

- Internship and Thesis:: 12 credits

General evaluation: All three training programs share similarities and have distinctive differences specific to each training institution. Among them, Hanoi University of Science and Technology and the Vietnam National University of Agriculture have more similarities as they both offer undergraduate programs in quality management and food safety. Meanwhile, Nong Lam University Ho Chi Minh City focuses on training engineers in food technology. Despite the differences in bachelor's and engineering training, all three programs share commonalities in relevant courses related to quality management and food safety. Core courses in this domain are integrated into the curriculum of all three training institutions.

3.3 Surveying program outcome

3.3.1 Survey participants

The participants in the survey encompass experts, employers, faculty members, and alumni currently employed in the field of food industry. Figure 1 to Figure 5 depict organizational structures related to the food industry participating in the survey.
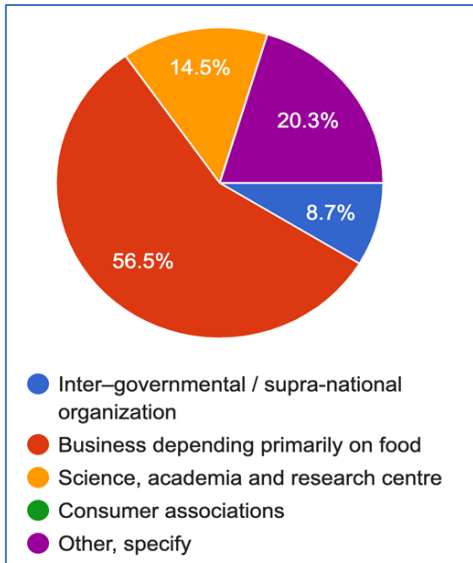
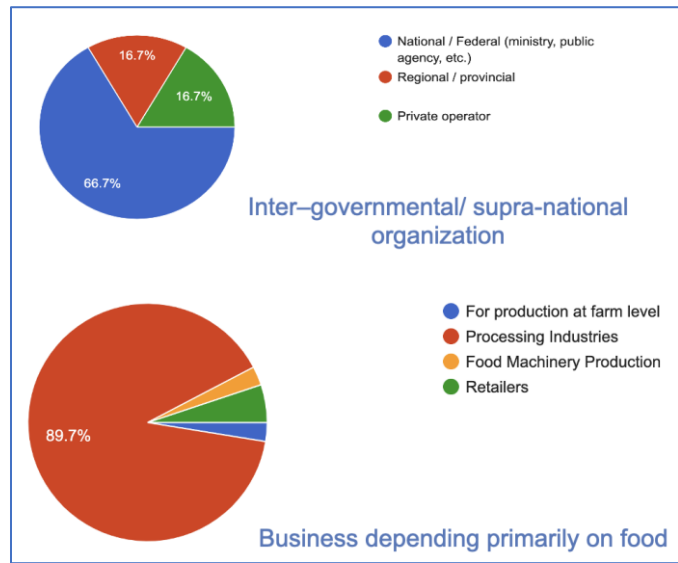**Figure 1. General characteristics of the surveyed organization**

Figure 2. Type of the organization

There were a total of 69 stakeholders surveyed, primarily located in the Southern region (Ho Chi Minh City and surrounding provinces) and the Northern region (Hanoi and surrounding areas), which have been analyzed. The survey responses from the Southern and Northern regions account for approximately 60% and 40%, respectively. The common characteristics of the surveyed organizations and companies are presented in Figure 1.

As shown in Figure 1, the types of organizations include those primarily involved in food-related businesses (approximately 57%), as well as those in science, academia, and research centers (15%), inter-governmental or supra-national organizations (9%), and other small-scale businesses (20%).

As demonstrated in Figure 2, businesses primarily dependent on food are dominated by processing industries (90%), followed by retailers (5%), production at the farm level (3%), and food machinery production (3%). Meanwhile, inter-governmental or supra-national organizations comprise national or Federal entities such as ministries and public agencies (67%), regional or provincial entities (17%), and private operators (17%).

The surveyed companies include many firms that have been established for a long time, for example, since 1912, but there are also newly established companies that have been operating for a few years. The majority of companies were founded more than 10 years ago.

The number of employees in the surveyed organizations is presented in Table 1. Based on the scale of the number of employees, it can be observed that small companies account for 77%, while medium-sized and large companies account for 16% and 7%, respectively. Typically, processing companies require high school and bachelor's degrees for their employees'

qualifications, while science, academia, and research centers often require master's and doctoral degrees.

Table 1. The number of employees in the surveyed organizations

Numbers of permanent employee	Numbers of surveyed company	Percentage
<100	53	76.8
100 - 1000	11	15.9
>1000	5	7.2

The majority of the surveyed companies demonstrate awareness of food safety across various domains.
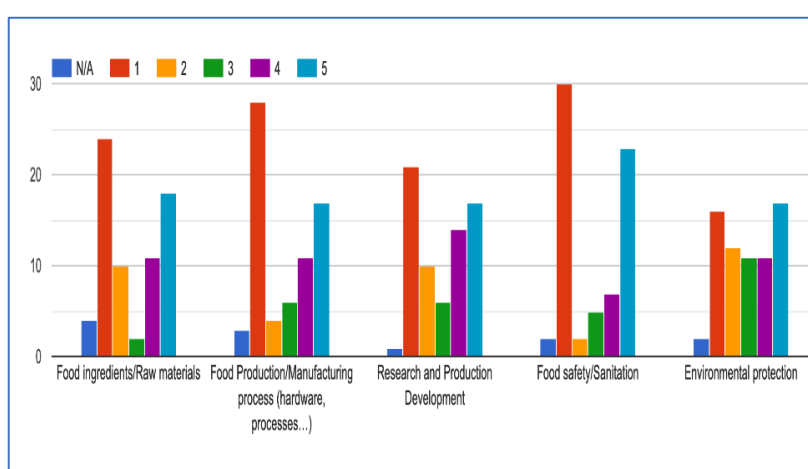
Figure 3. Organization's primary areas of interest in food
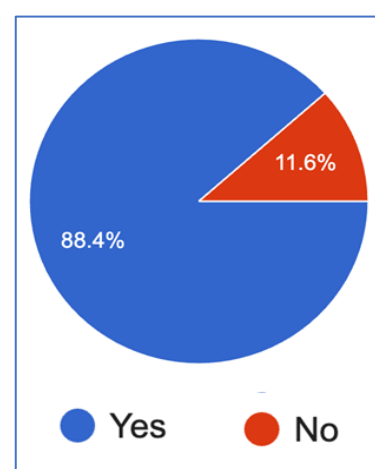
Figure 4. Percentage of surveyed companies require employees in the field of FSQM

As illustrated in Figure 3, the primary areas of interest in food safety include food ingredients/raw materials, food manufacturing processes, research and production development, food sanitation, and environmental protection. The findings indicate that the highest level of interest in food safety knowledge was observed in food production and food safety/sanitation. In addition, the surveyed companies expressed a desire to enhance the food service mindset and restaurant services provided to students, so that they align better with the requirements and needs of restaurant and food company chains. Moreover, they emphasized the importance of food safety knowledge in food storage and preservation.

More than 88% of the surveyed companies reported a need for employees in the field of food safety management, as shown in Figure 4. These employees are primarily involved in quality management, quality assurance, quality control, and research and development.

3.3.2   Survey results

The companies require their food safety management staff to possess knowledge and skills in various areas, such as understanding of food safety and food quality management (97%), food quality analysis techniques including physical, biological, chemical, and sensory (77%), and understanding of material properties (approximately 75%) (Figure 5). In addition, the companies emphasized the importance of English language proficiency, knowledge of nutrition, ability to stay abreast of food trends, and proficiency in operating machinery and equipment.
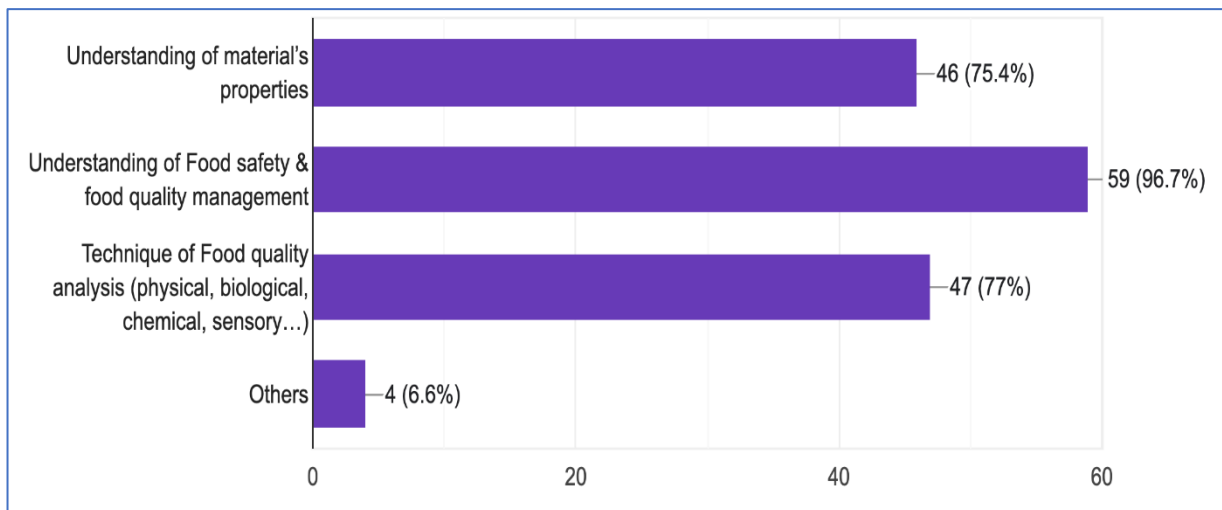
Figure 5. The specific requirements of the surveyed company for working in the field of food safety management

The survey objective is to provide students with training in food safety management, aimed at achieving the following outcomes: 1) knowledge, 2) cognitive skills, and 3) practical skills. Companies were required to provide their perspective and evaluation of the importance of these competencies. Figure 6 shows the basic knowledge (A) and social knowledge (B) required for working in the field of food safety management.

The results (Figure 6A) indicate that knowledge of quality and safety management systems is considered important by most companies, at approximately 83% and 87% respectively. Furthermore, techniques of processing and quality analysis are also deemed necessary for the field of food safety and management, with approximately 68% agreement. Additionally, Figure 6B shows that food legislation (86%) and food laws (84%) are the two most important social knowledge requirements contributing to food safety management, followed by food business (70%) and sociology (30%). Based on the above-mentioned requirements, it is crucial to design the food safety management program to incorporate quality and safety management systems, food legislation, and food laws.
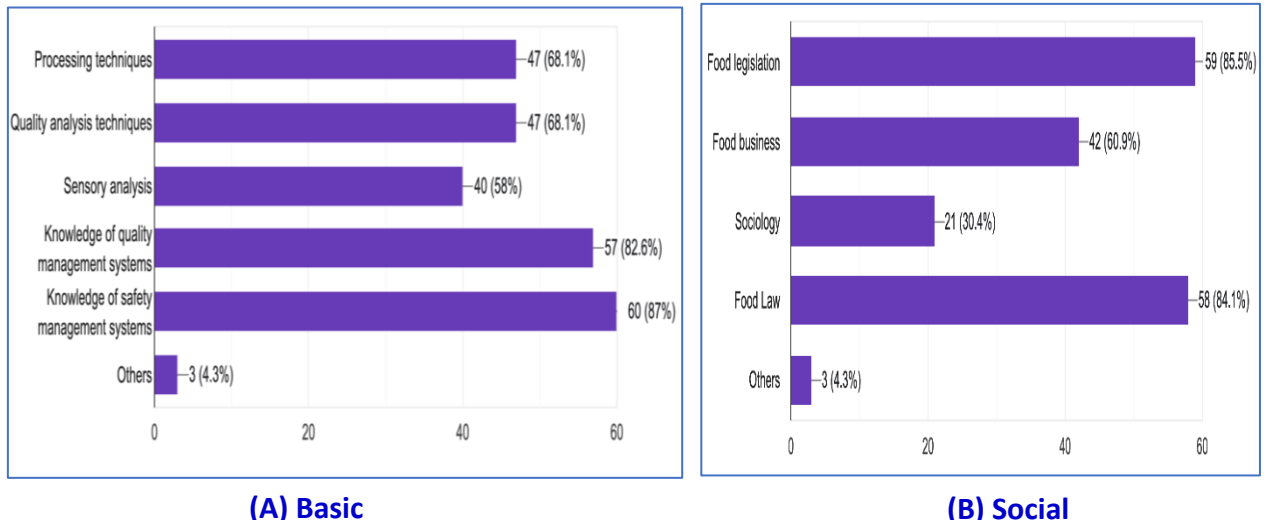
(A) Basic

(B) Social

Figure 6. The basic knowledge (A) and social knowledge (B) needed to work in the field of

The basic and practical skills required for the food safety management were also surveyed by companies. The basic skills are presented in Figure 7. The results indicated that knowledge of safety management systems (93%) and communication (74%) are the most important basic skills needed. Furthermore, other basic skill such as soft skills, time management, language, and information technology, which are more than 50% surveyed companies agreeed. For the practical skills, As such, those required skills should be included in the proposed training program.
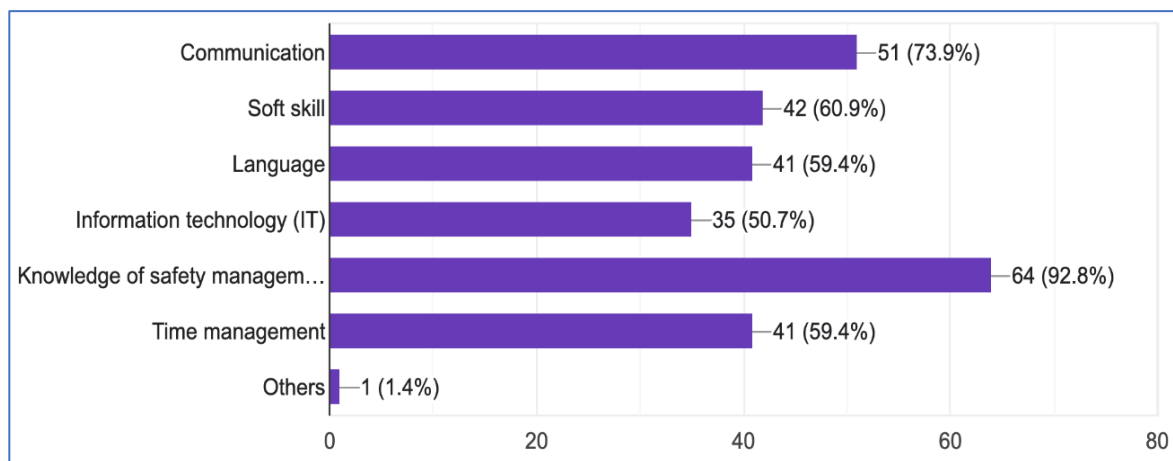
Figure 7. The basic skills needed to work in the field of food safety management

To excel in food safety management, students need a diverse skill set that includes both technical and soft skills. Technical competencies such as knowledge of quality system standards, risk assessment, safety management systems, and processing techniques and equipment are essential for working in the industry. Students should also have analytical and problem-solving skills, knowledge of statistics and sensory analysis methods, and the ability to communicate effectively. Practical skills like quality and sensory analysis, GMP (Good Manufacturing Practices) and SSOP (Sanitation Standard Operating Procedures) guidelines,

CCP (Critical Control Point) analysis, and HACCP (Hazard Analysis and Critical Control Point) plan and validation are necessary to do a good job. Furthermore, practical skills in processing techniques, equipment techniques, and food microbiology are also necessary for companies in the food safety industry Soft skills such as communication, teamwork, time management, and leadership are equally important. Good communication skills are crucial, as students must be able to effectively communicate with team members, stakeholders, and regulatory bodies. Additionally, knowledge of food laws and regulations, public speaking, good attitude, computer skills, data analysis, situational skills, research skills, and the ability to work independently and in a team are valuable assets. Students should also focus on continual learning, be motivated and self-disciplined, and have experience working in a food factory. To gain deeper understanding and develop leadership skills, students should consider studying to become auditors and learn about root cause analysis, PDCA (Plan Do Check Act), and data-driven management. Finally, having professional knowledge and proficiency in English are essential for success in the field of food safety management.
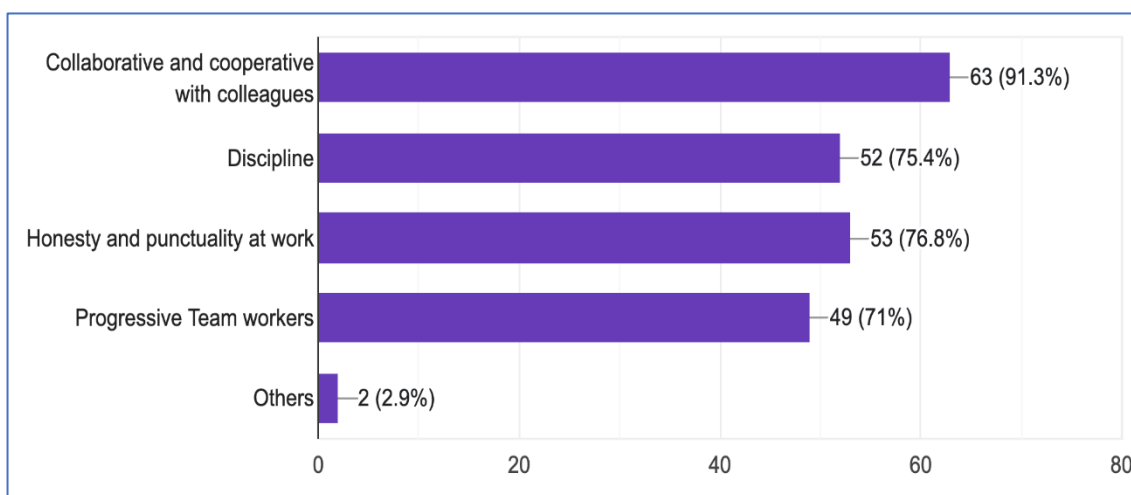
Figure 8. The attribute needed to work in the field of food safety management

Figure 8 displays the attributes necessary to work effectively in the field of food safety management. It is evident that being collaborative and cooperative with colleagues is the most essential trait, as indicated by over 91% agreement. Honesty and punctuality at work, along with being disciplined and a progressive team worker, also rank high on the list of important attributes.

To achieve quality manpower in the field of food safety management, it is important to have competencies in knowledge, cognitive skills, practical skills, interpersonal skills, and attitude. The companies were asked to provide their perspective and evaluation of the level of importance of these competencies on a scale ranging from 1 (less important) to 5 (highly important) (Figure 9).

(A) Food safety hazards and risks

(B) Food supply chains and food

(C) The practices and principles of food hygiene, health promotion and cleaning

(D) Food safety standards and regulations
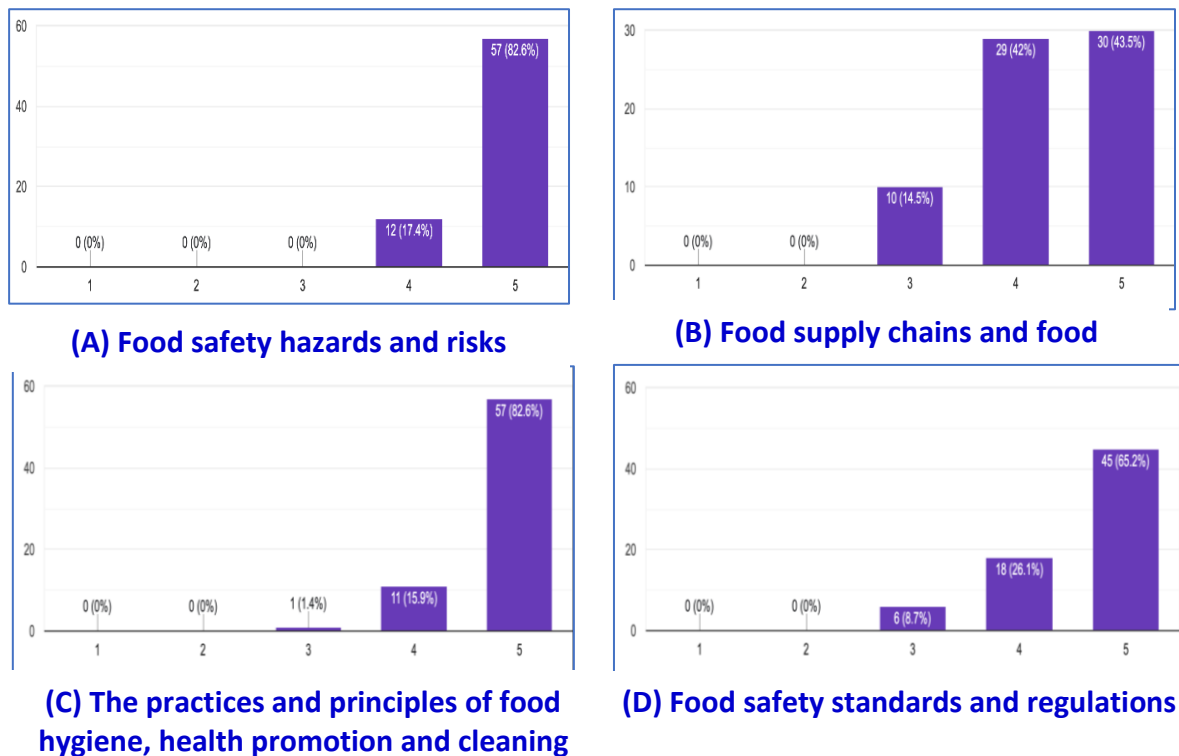
Figure 9. Evaluation of knowledge and understanding of different food safety areas a scale ranging from 1 (less important) to 5 (highly important)

Figure 9 shows the evaluation of the level of importance of knowledge in food safety and quality. It can be seen that knowledge and understanding of food hazards and risks (Figure 9A), food supply chains and food systems (Figure 9B), practices and principles of food hygiene, health promotion, and cleaning and sanitation (Figure 9C), and food safety standards and regulations (Figure 9D) are rated as high level of importance (4 or 5 on the scale). Therefore, these knowledge areas should be incorporated into the proposed training program in food safety management.

The results of the evaluation of cognitive skills in terms of risk assessment (Figure 10A), risk management (Figure 10B), and risk communication (Figure 10C) indicate that, in general, the majority of surveyed companies (approximately 90%) agree on the importance of cognitive skills in these areas.

Regarding risk assessment, students in the potential food safety and quality training program should demonstrate knowledge of the food system or value chain and assess potential food safety risks. They should also propose tailored solutions (risk management) to address food safety problems and challenges, considering multiple criteria and factors, including effectiveness, acceptability, and implementability. Moreover, students should exhibit critical analysis and review skills, logical thinking and reasoning abilities, and clear and effective communication skills (risk communication) to effectively convey their findings and recommendations.
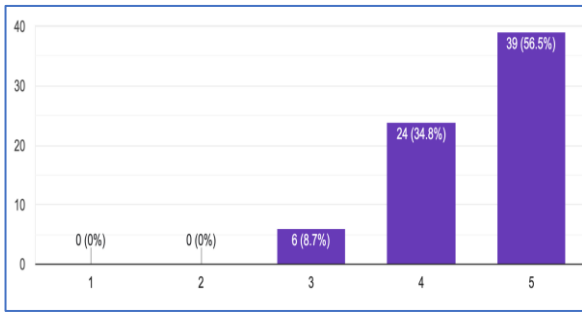
(A) Risk assessment
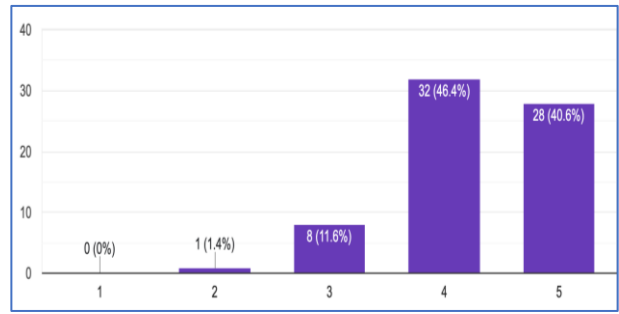
(B) Risk management
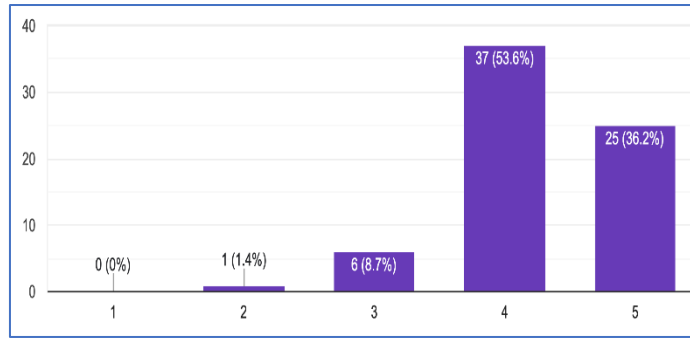
(C) Risk communication

Figure 10. Evaluation results of cognitive skills

According to Figure 11 illustrates the the survey results of practical skills. The results show that most companies acknowledged the significance of practical skills in food safety management. It is crucial to comprehend the methodology for selecting, designing, and/or implementing tools and approaches to identify, assess, control, predict, and prevent food safety hazards and risks in the food supply chain. The evaluation results for practical skills indicate a strong agreement level (over 91%) among respondents.
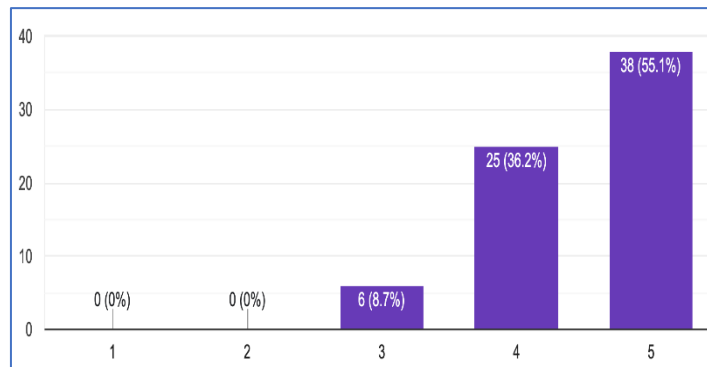
Figure 11. Evaluation results of practical skills

Figure 12 depicts the assessment of companies on the required interpersonal skills for effective food safety management. A majority of the companies surveyed rated their proficiency level on a 5-point scale from 3 to 5 for critical interpersonal skills, including the ability to work collaboratively as part of a team, communicate effectively (both orally and in

writing) with individuals, organizations, and groups of diverse backgrounds, experiences, and perspectives, using both technical and lay language, and demonstrating professional integrity, ethics, and a deep regard for gender and cultural diversity.
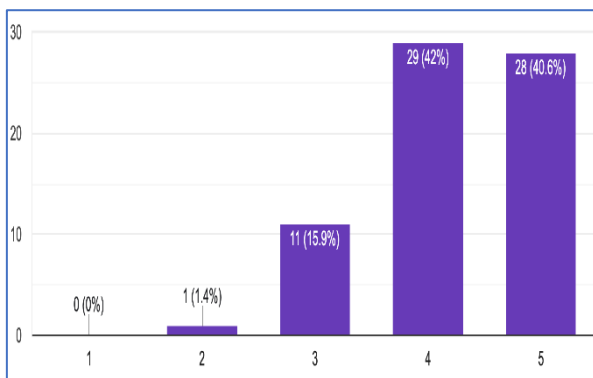
(A) Work effectively as part of a team
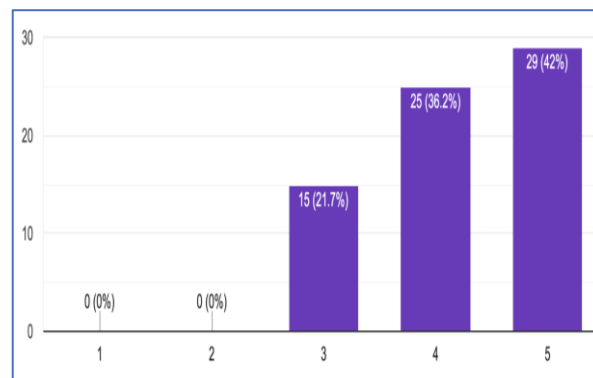
(B) Communicate, orally and in writing, effectively individuals, organizations and groups with diverse backgrounds and experiences and perspectives, both in technical and lay terms
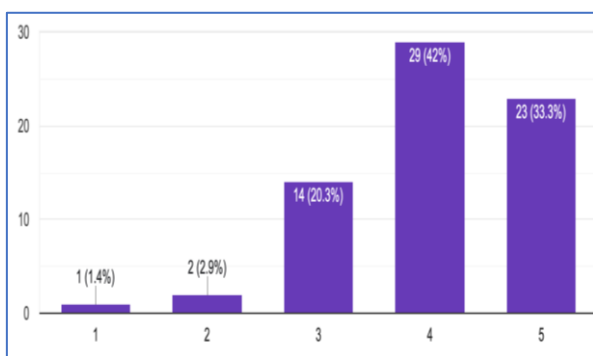
(C) Professional integrity, ethics, and respect for gender and cultural diversity

Figure 12. Evaluation results of interpersonal skills

The results of the survey on the expected training program's attitudes, as presented in Figure 13, indicate that over 83% of participating companies agreed and encouraged a food safety culture in all aspects of their operations. Only a very small number of companies (less than 1.4%) provided ratings of 1 or 2, with the majority of companies giving higher ratings. Furthermore, the willingness to pursue ongoing education to keep abreast of changes in technology, transitions in the agricultural system, and emerging food safety threats was also highly rated, with a very high proportion of 97% agreeing (rated between 3 and 5 on a 5-point scale) with this attitude.

In addition to the information provided in the survey regarding knowledge, attitudes, and skills, the independent opinions of businesses on the food safety system are also very important.

The overall results of businesses' opinions on the requirements are as follows. To prepare students for the labor market, universities should focus on providing them with a combination of specialized knowledge, practical skills, and soft skills such as communication, teamwork,

and problem solving. Practical skills should be emphasized in the curriculum, including the ability to anticipate and prevent mistakes, knowledge of quality and safety management systems, and the ability to conduct risk assessments. Internships and professional practice should be increased to provide more opportunities for students to apply their knowledge and skills in real-world settings.

A) Commitment to the practice and promotion of food safety culture across all professional activities

B) A willingness to pursue continuing education to stay appraised of changes in technology, transitions in agricultural systems and emerging food safety threats
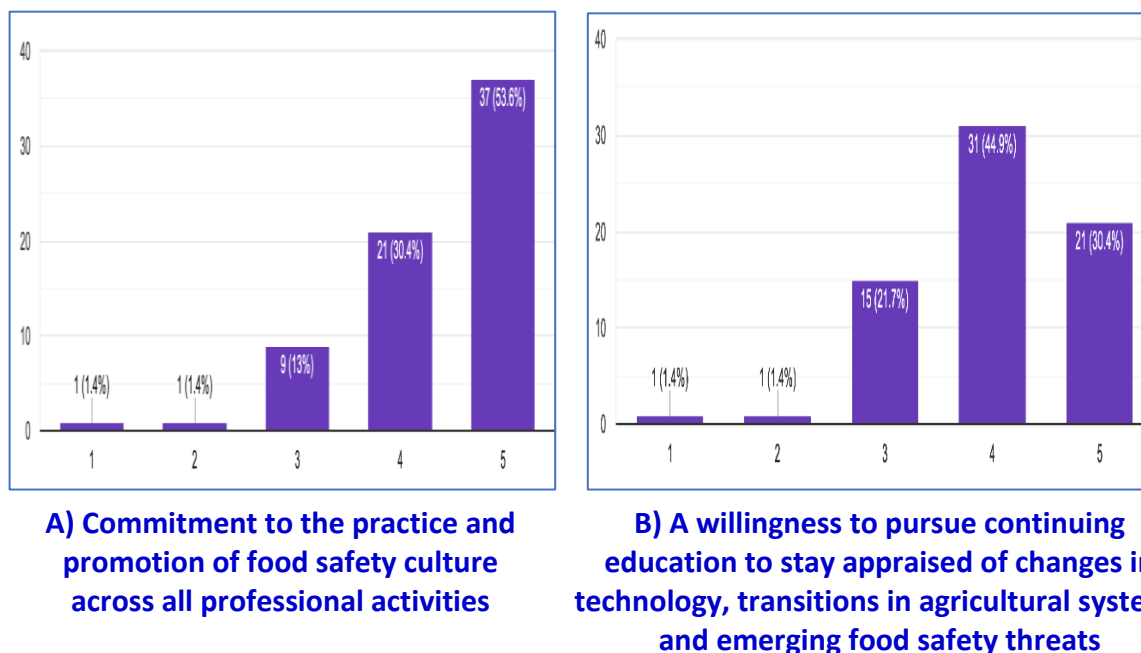
Figure 13. Evaluation results of attitude

Additionally, students should be encouraged to identify clear career objectives and pursue them with determination. Finally, universities should work closely with businesses to align their curricula with industry needs, and provide students with opportunities to practice and develop their skills in a realistic business environment.

In conclusion, the survey assessed the training needs against the established learning outcomes for the food safety management training program, with relevant stakeholders including food processing companies of various scales, universities, and state management agencies. The results of the investigation collected and summarized training needs related to quality management and food safety. All stakeholders demonstrated that food safety and hygiene is necessary and important in the food industry. At the same time, they also provided positive and important feedback to contribute to the development of a better training program that is closely linked to practice. Finally, the survey results also showed that the learning outcomes were entirely appropriate. It can be concluded that the current ELO version is suitable for training purposes in response to actual food production, supply, and service in Vietnam. The training program should include knowledge, practice, and skills specific to food safety and quality management.

3.4 Ajusting program learning outcome

3.4.1 PLO adjusting

In order to develop a food safety management training program, it is crucial to first determine appropriate learning outcomes that meet the training needs of the food industry. The objective of the survey was to provide evidence-based assessment of the program learning outcomes (PLOs) for the Food Safety and Quality Management training program (FSQM) in Vietnam. The survey aimed to collect and evaluate the program's learning outcomes from relevant stakeholders to contribute to building a training program that is appropriate and aligned with practical needs in the food industry. The survey results demonstrate that all stakeholders recognize the importance of food safety and hygiene in the food industry, and they provided positive and significant feedback to contribute to the development of a better training program that is closely linked to practice. Therefore, the survey results helps learning outcomes to be adjusted to be entirely appropriate.

The PLO survey assessed the training needs against the established learning outcomes for the food safety management training program, with relevant stakeholders including food processing companies of various scales, universities, and state management agencies. The results of the investigation collected and summarized training needs related to quality management and food safety. All stakeholders demonstrated that food safety and hygiene is necessary and important in the food industry. At the same time, they also provided positive and important feedback to contribute to the development of a better training program that is closely linked to practice. Finally, the survey results also showed that the learning outcomes were entirely appropriate. It can be concluded that the current PLO version is suitable for training purposes in response to actual food production, supply, and service in Vietnam.

The training program should be divided in Bachelor and Engineer separtely should include knowledge, practice, and skills specific to food safety and quality management.

3.4.2 Result of adjusting

PLO updating for the Bachelor and Engineer training program about FSQM in Vietnam

	Bachelor	Engineer
Knowledge Skills	*The graduate should be able to:* 1. Understanding of food safety hazards and risks. 2. Understanding of food chains and food systems 3. Understanding of the practices and principles of food hygiene, health promotion and cleaning and sanitation. 4. Understanding of food safety standards and regulations	*The graduate should be able to:* 1. Analyzing food safety hazards and risks. 2. Evaluating food chains and food systems. 3. Applying the practices and principles of food hygiene, health promotion and cleaning and sanitation. 4. Understanding of food safety standards and regulations

	Bachelor	Engineer
Cognitive Skills	5. Understanding a food system or value chain and assess potential food safety risks. 6. Proposing tailored solutions (risk management) to food safety problems and challenges, taking into account multiple criteria and factors e such as effectiveness, acceptability, and implementability (risk management). 7. Demonstrate skills of critical analysis and review, logical thinking and reasoning, and clear and effective communication.	5. Analyzing a food system or value chain and assess potential food safety risks. 6. Proposing tailored solutions (risk management) to food safety problems and challenges, taking into account multiple criteria and factors e such as effectiveness, acceptability, and implementability (risk management). 7. Demonstrate skills of critical analysis and review, logical thinking and reasoning, and clear and effective communication.
Practical skills	8. Approaching to Predict/Prevent/ food safety hazards and risk in food systems. 9. Analysing food safety and quality issues through case studies, project based learning and real specific situation at the enterprise	8. Approaching to Predict/ Prevent/ Detect/Assess/Control/Respond/ Communicate food safety hazards and risk in food systems. 9. Analysing food safety and quality issues through case studies, project based learning and real specific situation at the enterprise
Interpers onal skills	10. Working effectively as part of a team 11. Characterizing professional integrity, ethics, and respect for gender and cultural diversity.	
Attitude	12. Commiting to the practice and promotion of food safety culture across all professional activities. 13. Continuing education to stay appraised of changes in technology, transitions in agricultural systems and emerging food safety threats.	

PLOs of Bachelor and Engineer program are developed for FSMQ, Two PLOs have same requirement for interpersonal skills and attitudes. Knowledge of 2 PLOs are distinguished in term of the abilities of knowledge, cognitive and practicals.

3.5 BULDING CURRICULUM PROGRAM

The matrix between Program Learning Outcomes (PLOs) and courses is constructed based on the results of PLO surveys and the content of the curriculum. Subsequently, an expert group discusses and proposes a correlation matrix between courses and PLOs, as presented in the matrix below. The matrix illustrates the contribution of individual courses to achieving PLOs and course components.

Table xxx. Matrix between PLOs and Courses

No	Course name	Credit (Bachelor)	Credit (Engineer)	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13	PLO14	Number of level A/Course	Number of level I/Course	Number of level R/Course	Number of level M/Course
1	Philosophy of Marxism and Leninism	3	3	I	I	I	I	I	I	I	I	I	I	I	R	I	I	0	13	1	0
2	Physical training 1	1	1	I	I	I	I	I	I	I	I	I	I	I	I	I	I	0	14	0	0
3	Introduction to Viet Nam Law system	2	2	I	I	I	I	I	I	I	I	I	I	I	R	I	I	0	13	1	0
4	Professional English 1	3	3	I	I	I	I	I	I	I	I	I	I	R	I	I	I	0	13	1	0
5	Political economics of Marxism and Leninism	2	2	I	I	I	I	I	I	I	I	I	I	I	R	I	I	0	13	1	0
6	Military training 1	3	3	I	I	I	I	I	I	I	I	I	I	I	I	I	I	0	14	0	0
7	Practical Military training	3	3	I	I	I	I	I	I	I	I	I	I	I	I	I	I	0	14	0	0
8	Calculus 1	3	3	I	I	I	I	I	I	I	I	I	I	I	I	I	I	0	14	0	0
9	Physics 1	2	2	R	R	R	I	I	I	I	I	I	I	I	I	I	I	0	11	3	0
10	Physics 1 lab	1	1	R	R	R	I	I	I	I	I	I	I	I	I	I	I	0	11	3	0
11	General Chemistry 1	2	2	I	I	I	I	I	I	I	I	I	I	I	I	I	I	0	14	0	0
12	General Chemistry 1 lab	1	1	I	I	I	I	I	I	I	I	I	I	I	I	I	I	0	14	0	0
13	Physical training 2	1	1	I	I	I	I	I	I	I	I	I	I	I	I	I	I	0	14	0	0
14	Professional English 2	3	3	I	I	I	I	I	I	I	I	I	I	M	I	I	I	0	13	0	1
15	General English 1	4	4	I	I	I	I	I	I	I	I	I	I	R	I	I	I	0	13	1	0
16	Scientific Socialism	2	2	I	I	I	I	I	I	R	I	I	I	I	I	I	I	0	13	1	0
17	Calculus 2	3	3	I	I	I	I	I	I	I	I	I	I	I	I	I	I	0	14	0	0
18	Physics 2	2	2	R	R	R	I	I	I	I	I	I	I	I	I	I	I	0	11	3	0
19	Physics 2 lab	1	1	R	R	R	I	I	I	I	I	I	I	I	I	I	I	0	11	3	0
20	General Chemistry 2	2	2	R	R	I	I	I	I	I	I	I	I	I	I	I	I	0	12	2	0
21	General Chemistry 2 lab	1	1	R	R	I	I	I	I	I	I	I	I	I	I	I	I	0	12	2	0
22	Biological Sciences 1	2	2	R	R	I	I	I	I	I	I	I	I	I	I	I	I	0	12	2	0
23	Biological Sciences 1 lab	1	1	R	R	I	I	I	I	I	I	I	I	I	I	I	I	0	12	2	0
24	General English 2	3	3	I	I	I	I	I	I	I	I	I	I	R	I	I	I	0	13	1	0
25	Ho Chi Minh's Thoughts	2	2	I	I	I	I	I	I	R	I	I	I	I	I	I	I	0	13	1	0
26	Probability and Statistics	3	3	I	I	R	I	I	I	I	R	I	I	I	I	I	I	0	12	2	0
27	Organic Chemistry	2	2	R	R	I	I	I	I	I	I	I	I	I	I	I	I	0	12	2	0
28	Organic Chemistry lab	1	1	R	R	I	I	I	I	I	I	I	I	I	I	I	I	0	12	2	0
29	Biological Sciences 2	2	2	R	R	I	I	I	I	I	I	I	I	I	I	I	I	0	12	2	0
30	Biological Sciences 2 lab	1	1	R	R	I	I	I	I	I	I	I	I	I	I	I	I	0	12	2	0
31	History of Vietnamese Communist Party	2	2	I	I	I	I	I	I	I	I	I	I	I	I	I	I	0	14	0	0

#	Course	Cr1	Cr2	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13	PLO14	A	I	R	M
32	Food chemistry	4	4	M	R	R	I	I	I	I	I	I	I	I	I	I	I	0	11	2	1
33	Analytical methods in food quality assessment	2	3	R	I	I	I	I	R	I	M	I	I	I	I	I	I	0	11	2	1
34	Nutrition	2	2	I	R	M	I	I	I	I	I	I	I	I	I	I	I	0	12	1	1
35	Food safety	2	2	M,A	R	R	M	M	R	R	R	R	I	I	I	I	I	1	5	6	3
36	Food microbiology	2	2	M	I	R	I	M	I	I	I	I	I	I	I	I	I	0	11	1	2
37	Sensory analysis of food	2	2	I	I	I	I	I	I	R	R	R	I	I	I	I	I	0	11	3	0
38	Food testing	3	3	R	I	I	I	I	R	I	M	I	I	R	M	R	R	0	7	5	2
39	Food quality assurance and management system	3	3	R	M,A	M	M	R	R	R	M	R	I	I	I	I	I	1	5	5	4
40	Food safety law and regulation	2	2	R	M	R	M,A	R	M	R	R	R	I	I	I	I	I	1	5	6	3
41	Food safety culture	2	2	R	R	R	I	I	I	I	I	R	I	R	M	M,A	M	1	6	5	3
42	Statistical analysis in food technology	3	3	M	M	R	I	R	R	R	M	R	R	I	I	I	I	0	5	6	3
43	Food marketing	2	2	I	I	I	I	I	I	I	I	R	I	I	R	R	R	0	10	4	0
44	Food additives	2	2	I	I	I	R	I	I	I	M	R	I	I	I	I	I	0	11	2	1
45	Microbiological control of food	3	3	M	R	M,A	R	R	I	I	I	I	I	I	I	I	I	1	9	3	2
46	Physico-chemical analysis in food	2	2	R	I	I	I	I	R	I	M	I	I	I	I	I	I	0	11	2	1
48	Risk analysis	3	3	M	R	R	R	R	M,A	R	M	R	R	I	I	I	I	1	4	7	3
49	Food toxicology	2	3	R	R	R	R	R	R	R	R	R	I	I	I	I	I	0	5	9	0
50	Internship	6	6	M	M	M	M	R	R	R	R	M	R	R	R	R	R	0	0	9	5
51	Thesis	9	12	M	M	M	M	R	R	R	M,A	M	R	M	R	R	R	1	0	7	7
ELECTIVE MODULE FOR ENGINEEE																					
52	Work safety and industry hygiene		3	R	R	R	R	R	M	M	R	M	R	R	R	M	R	0	0	10	4
53	Rapid analytical methods for food quality control		3	R	I	I	I	I	R	I	M	I	I	I	I	I	I	0	11	2	1
54	Hygienic design in food industry		3	R	R	R	R	R	M	M	R	M	R	R	R	M	R	0	0	10	4
55	Food authenticity		3	R	R	R	R	R	R	R	R	R	R	R	R	R	M,A	1	0	13	1
56	Design and management of QC & QA		3	R	R	R	R	R	R	R	R	R	M	R	R	R	R	0	0	13	1
																			0	0	
	Total	120	140																0	0	

Aggregating the number of courses by contribution levels (*excluding elective courses*)

	A	I	R	M												A	I	R	M
Level I	23	27	33	42	41	39	40	36	40	47	42	43	46	46			49		
Level R	24	23	17	8	12	12	13	11	10	7	11	10	6	7				45	
Level M	8	5	5	5	2	4	2	8	5	1	2	2	3	2					22
Level A	1	1	1	1	0	1	0	1	0	0	0	0	1	1	8				
The number of courses by contribution levels PLO	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55				

In this context:

• I (Introduced) – Courses provide support in achieving PLOs at an introductory/beginner level.

• R (Reinforced) – Courses provide support in achieving PLOs at an advanced level beyond the introductory stage. In these courses, learners have ample opportunities for practical application, experimentation, real-world scenarios, etc.

• M (Mastery) – Courses strongly support learners in mastering or achieving PLOs. Successful completion of these courses indicates a high level of mastery of an essential aspect of the PLO or even mastery of the entire PLO.

• A (Assessed) – These courses are crucial and require data/evidence collection to assess the extent to which learners achieve PLOs

3.6 Comparing number credits, list of modules, course description in training program

3.6.1 Comparing the number of credits and modules

Comparing the number of credits and modules of quality management and food safety at the 5 years engineer level (NLU - HUST) and 4 years bachelor level (VNUA - HUST).

No	Professional component	HUST (Crds)	VNUA (Crds)	NLU (Crds)
I	**General Education**	51	41 (1+2+4+IV)	58
1	Mathematics and basic sciences	32	22	27
2	Scocial science and Humanities	13 (in accordance with regulations of Vietnam Ministry of Education and Training)	10	11
3	Physical education - national defense and security education	-		8
4	English	6 (02 basic English courses)	6	10
II	Enginerring Education	110 hrs	13	-
III	**Foundation of Engineering**	48	55	59
IV	**Soft skills**	9 Include of 02 compulsory modules: Social/Start-up/other skill (6 credits) Technical Writing and	3 (include 2 credits of Introduction to informatics, 1 credit of soft	9 include Specialized English (4 credits), laboratory

No	Professional component	HUST (Crds)	VNUA (Crds)	NLU (Crds)
		Presentation (3 credits)	skils)	skils (1 credit), Academic presentation skills (1 credit), Research methodology (3 credits)
V	**Elective Module**	**16** In specialization of Food Quality Management	**12**	**16**
VI	**Engineering Practicum**	**2** (scheduled for third year)	**3** (intership at company in third year	**4** (internship at company)
VII	**Bachelor Thesis or Design Project**	**6** In specialization of Food Quality Management	**10**	**12**
	Total	132	131	158

Three programs are in the same structures giuded by MOET

3.6.2 List of modules in the Food Safety and Quality Management knowledge block

No	HUST	VNUA	NLU
		BACHELOR	
		Obligatory courses	
	Quality management in food industry		There is no undergraduate program (Bachelor) in quality management and food safety
	Analytical methods in Food quality assessment	Food analysis: 2 crds	
	Food safety	Food safety: 2 rds	
	Food Packaging	Food packaging: 2 crds	
	Food Additives	Food additives: 2 crds	
	Sensory analysis	Food sensory evaluation: 2 crds	
	Microbiological control of food		
	Physico-chemical analysis in food		
	Food quality assurance and management system	Quality management and assurance system: 2 crds	
	Statistical analysis in food technology		

No	HUST	VNUA	NLU
	Food marketing		
	Project in quality management	Food safety and quality management project: 1 crds	
		Food toxicity: 2 crds	
		Food quality control: 3 crds	
		Food supply chain management and traceability: 2 crds	
		Food safety inspection techniques: 2 crds	
		Good agricultural production practice: 2 crds	
		Risk analysis: 2 crds	
		Elective courses	
		Food borne disease: 2 crds	
		Industrial catering management: 2 crds	
		Food plant sanitation: 2 crds	
		Food hygiene and safety: Educational communication: 2 crds	
		Molecular biology and immunological techniques in food analysis: 2 crds	
		Food Poison Control: 2 crds	
	ENGINEER		
	Hygienic design in food industry	There is no undergraduate program (Engineer) in quality management and food safety	The principle of food preservation
	Food authenticity		Quality Management in Food Technology I
	Rapid analytical methods for food quality control		Quality Management in Food Technology II
	Total quality management of food supply chain		Food Supply Chain Management
	Management of hazard and quality assurance in food processing industry		Microbiological Testing of Food
	Engineer specialization project in quality management (EP1)		

3.6.3 Compare course descriptions

Compare the courses and course descriptions of university for quality management and food safety training majors are showed in Appendix 6.

3.6.4 SWOT analysis

STRENGTHS	WEAKNESSES
The current status of training human resources for the food industry in Vietnam reflects a rising level of food consumption and an increased export of agricultural and food products. Consequently, there is a notable investment in the field of food production. This has led to a surge in the number of students enrolling in university-level food technology programs to meet the growing demands of the industry.	Currently in Vietnam, there are 40 universities offering training in food technology, while only 6 universities focus on training in Quality Management and Food Safety. However, the available enrollment data is incomplete and does not distinctly indicate the number of students for each major, as it calculates the number based on general quotas for major groups. It's noteworthy that some universities specialize solely in Quality Management and Food Safety without providing general training in the broader field of food technology.
The three universities have distinct training majors, training durations, and an equivalent number of credits (ranging from 130 to 132 credits). It is noteworthy that the credit calculation methodology across these universities is consistent, employing a structure that encompasses Theory, Exercise, and Practice. Specifically, the credit is determined with the ratio of 15 theory hours equaling 1 credit.	Two universities, (HUST and VNUA), do not offer a major specifically in quality management; instead, they provide specialization in this field. Additionally, NLU does not currently have a major or specialization in quality management.
The PLOs across all three universities encompass knowledge, professional skills, soft skills, and attitudes. Notably, HUST has a larger number of output standards compared to the other two universities	Due to the differing Program Learning Outcomes (PLOs) at the university, the level of connectivity is expected to be limited.
The curriculum for the training programs at each university possesses distinctive characteristics, reflecting the unique features and approaches of each institution	
The knowledge foundation of the three universities differs, resulting in unique characteristics for each institution. Notably, the basic math and science knowledge block at HUST and NLU surpasses that of VNUA. Conversely, VNUA excels in basic subjects compared to HUST and NLU. Regarding soft skills, HUST and NLU allocate 9 credits, while VNUA designates 6 credits.	Given the variations in modules within the knowledge blocks, the interconnectivity among the universities in this field is also constrained due to these differences.

Moreover, the graduation projects/theses at the three universities exhibit clear distinctions.	
Each university provides detailed information about its course list. Notably, NLU and VNUA offer a greater number of elective courses compared to HUST.	
OPPORTUNITY	**THREAT**
There is a substantial demand for human resources in the Food Technology industry, driven by the increasing requirements for product quality. As quality standards rise, job opportunities for students specializing in quality management and food safety appear promising.	In cases where there is no distinct training major in Food Safety & Quality Management, and instead there is only a specialization within the broader Food Technology industry, the name on the student's degree might only reflect the major. This could potentially lead to employers or recruitment units overlooking the specialization details, impacting their understanding of the candidate's specific expertise. It underscores the importance of clear communication and documentation regarding specialized training within the broader field of study
Even though the number of credits across the universities is identical, the divergence in knowledge blocks and output standards results in distinct identities among students within the same training major.	When universities collaborate to establish new majors and specializations in food safety and quality management, it becomes essential to establish a unified main curriculum for the program. This necessitates adjustments to existing programs, and such modifications should be guided by a carefully crafted roadmap. This roadmap serves as a strategic plan outlining the step-by-step process of implementing changes, ensuring coordination, and fostering effective connections between the universities involved

Evaluation

Currently, bachelor and engineering programs in Vietnamese universities predominantly focus on fields such as Food Technology and Food Engineering, with only a limited number offering programs specifically in Food Safety and Quality Management (FSQM). Notably, certain universities concentrate on providing specialized training in quality management and food safety without offering broader programs in related fields.

The demand for skilled professionals in the areas of Food Technology, Food Engineering, Food Quality, and Food Safety Management is significant. As product quality standards continue to rise, job opportunities for students specializing in quality management and food safety appear promising within the current landscape of Vietnamese university programs.

3.7 Build a program curriculum consistent with the requirements of the Ministry of Education, the university and international integration

3.7.1 Objective of food safety programme

(1) Knowledge of a wide specialized bases for a good adaptation to various jobs beings in the wide field of Food Safety in order to work independently.

(2) Professional skills and personal qualities needed to succeed in careers: scientific and professional working methods, good systematic and analytical thinking; integrating in the international environment.

(3) Social skills needed to work effectively in multidisciplinary specialization and in the international environment.

(4) Capability in self-training, self-updating knowledge and self-doing scientific research. Capability in exploring practical problems, applying knowledge and innovative scientific and technical achievements to solve practical problems.

3.7.2 Relevance between objectives and PLOs of the FS program.

PLOs	1. Knowledge			2. Cognitive		3. Practical			4. Interpersonal			5. Attitude		
Objective	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1st				x	x								x	x
2nd			x	x	x							x	x	x
3rd						x	x	x	x	x	x	x	x	x
4th				x	x		x						x	x

3.7.3 Program curriculum Module

No	Modules	Credit (Bachelor)	Credit (Engineer)
General modules: 36-38%		Recomd	Recomd
1	Philosophy of Marxism and Leninism	3	3
2	Physical training 1	1	1
3	Introduction to Viet Nam Law system	2	2
4	Professional English 1	3	3
5	Political economics of Marxism and Leninism	2	2
6	Military training 1	3	3
7	Practical military training	3	3
8	Calculus 1	3	3
9	Physics 1	2	2
10	Physics 1 lab	1	1
12	General chemistry 1 lab	1	1
13	Physical training 2	1	1
14	Professional English 2	3	3
15	General English 1	4	4
16	Scientific Socialism	2	2
17	Calculus 2	3	3
18	Physics 2	2	2
19	Physics 2 lab	1	1

No	Modules	Credit (Bachelor)	Credit (Engineer)
20	General chemistry 2	2	2
21	General chemistry 2 lab	1	1
22	Biological sciences 1	2	2
23	Biological sciences 1 lab	1	1
24	General English 2	3	3
25	Ho Chi Minh's thoughts	2	2
26	Probability and Statistics	3	3
27	Organic chemistry	2	2
28	Organic chemistry lab	1	1
29	Biological sciences 2	2	2
30	Biological sciences lab 2	1	1
31	History of Vietnamese Communist Party	2	2
	- **Specialization modules: 62-64%** - **Core foundation: 35-37%** - **Supplement: 6-8%** - **Elective: 11-13%** - **Internship and Graduation thesis: 8%**		
32	Food chemistry	4	4
33	Analytical methods in food quality assessment	2	3
34	Nutrition	2	2
35	Food safety	2	2
36	Food microbiology	2	2
36	Sensory analysis of food	2	2
37	Food testing	3	3
38	Food quality assurance and management system	3	3
39	Food safety law and regulation	2	2
40	Food safety culture	2	2
41	Statistical analysis in food technology	3	3
42	Food marketing	2	2
43	Food additives	2	2
44	Microbiological control of food	3	3
45	Physico-chemical analysis in food	2	2
46	Risk analysis	3	3
47	Food toxicology	2	3
48	Internship	6	6
49	Thesis	9	
	ELECTIVE MODULE FOR ENGINEEE		
50	Food safety and industry hygiene		3
51	Rapid analytical methods for food quality control		3
52	Hygienic design in food industry		3
53	Food authenticity		3

No	Modules	Credit (Bachelor)	Credit (Engineer)
54	Design and management of QC & QA		3
	……..		
55	Internship		**3**
56	Thesis		**15**
	Total	**120**	**150-180**

3.7.4 Courses description

Description of some core courses are developed for the survey purpose, in detail as follows

1. **Food chemistry:** Chemical structure of food and food ingredients. Structure and role of proteins, carbohydrates, lipids in food. Impact of processing on changes in their composition and function.

2. **Analytical methods in food quality assessment:** Fundamentals of spectroscopy, chromatography, nuclear magnetic resonance spectroscopy, mass spectrometry as well as the operation and applications of common equipment. Apply theoretical knowledge and operational skills to analyze food nutrients, restricted ingredients (such as food additives), and analyze food contaminant residues (such as heavy metals, drugs pesticides, veterinary drugs).

3. **Human nutrition:** Roles and needs of nutrients; Digestion and absorption of nutrients; Disease nutrition and public health; Nutrition for different target groups; Methods of assessing nutritional status; Functional foods; Food security.

4. **Food safety:** Requirements for food safety and hygiene in the food industry for practical application. Basic knowledge about hazards, risks of pollution, and food poisoning due to agents. Prevention and management measures.

5. **Food microbiology:** Beneficial and harmful microorganisms in different food groups including morphology, metabolism, growth, genetics as well as control measures of these microorganisms. Industrial application of microorganisms in food production and processing.

6. **Sensory analysis of food:** Basic knowledge of food sensory analysis techniques through human senses. Receiving and transmitting sensory information. Perceptual threshold. Apply sensory methods to specific situations. Conduct sensory evaluation of foods during processing and recipe development.

7. **Food testing:** Sampling and sample preparation methods; Testing food using sensory methods; Testing microbial indicators in food; Testing some inorganic ingredients in food; Testing some organic ingredients in food; Testing of raw materials and some food products.

8. **Food quality assurance and management system:** Food quality; Activities, methods of management and food quality inspection; Prerequisite programs; HACCP hazard analysis and critical control point system; Standardized system.

9. **Food safety law and regulation:** The importance and development of food law, food standards, codes of practice and specifications (codex alimentarius), the development of legal food standards (national and international) are also as labeling requirements. How to interpret the content of regulations and use them to support specialist needs in the food industry.

10. **Risk analysis:** Physical, chemical and biological issues related to food safety and how to apply the factors in risk analysis. Conduct simple hazard analyzes according to national and international guidelines.

11. **Food toxicology:** Penetrating, metabolizing and eliminating toxins in the body; Natural poisons; Toxins in the food industry; Chemical toxicity; Some prevention and elimination measures.

12. **Food safety and industry hygiene:** Regulations, Laws, Decrees, Circulars, policies in labor protection and production. The effects of temperature, humidity, noise, vibration... on labor safety, measures and prevention. Effects of dust and gas treatment methods to create clean rooms in production. Safety when using electrical equipment, chemicals, microorganisms and fire and explosion prevention. Safe use, maintenance and design of thermal and mechanical machines. Standards for testing equipment subjected to pressure and heat. Scope of application of hygiene and safety in the field of biotechnology and food technology.

13. **Rapid analytical methods for food quality control:** Trends in rapid analysis of food quality as well as advantages and disadvantages of rapid analysis and scope of application. Principles and techniques of chemistry, biochemistry, molecular biology and immunology applied in rapid analysis of food quality. The tests perform a number of rapid analytical methods as specified by ISO or AOAC

14. **Hygienic design in food industry:** Food factory hygiene; The relationship between biosecurity, microorganisms, allergens and hygienic conditions for food production; Sources of food contamination; Personal hygiene and food handling ensure hygiene; The role of HACCP in hygiene systems at food processing factories; Detergents, disinfectants and cleaning methods; Equipment in food factory hygiene systems; Food waste treatment; Pest control at the factory; Design and construction of hygienic conditions for food processing factories; Food factory hygiene and quality management.

15. **Food authenticity:** Food traceability inspection activities. Traceability verification technique. Develop methods and techniques to verify the origin of food products. Specific properties of the product (physical, chemical...) serve to verify the origin of food as well

as methods of detection and inspection . Ability to counterfeit various foods. Food traceability system.

16. **Design and management of QC & QA:** Develop and manage quality control and quality assurance programs during the food production process. Quality Control (QC) and Quality Assurance (QA); Quality control and assurance methods and systems; Establish a quality control and quality assurance system; Practice QC and QA management.

17. **Food safety culture:** Provides knowledge and understanding of food safety culture and the shared values, beliefs and norms that influence food safety thinking and behavior within an organization. Upon completion of this course, students will be able to: Explain the concept of food safety culture; Discuss the development of food safety culture; Identify requirements to implement a food safety culture; Be aware of food safety culture assessment requirements.

3.8   Survey of the newly developed program curriculum

3.8.1   Reasons for conducting the survey

Surveying university-level education programs is an integral part of ensuring the quality of education and meeting the evolving needs of society and the labor market. The surveying of university training programs and the standardization of program outcomes are crucial because they bring about numerous benefits in assuring the quality of education and meeting the demands of the community, businesses, and society. Additionally, the surveying of training programs and program outcomes is not only a significant factor in promoting the quality of education but also aids in maintaining flexibility and readiness to respond to new challenges and opportunities.

The main reasons that need to be mentioned are 1) ensuring the quality of education, 2) maintaining connectivity and meeting the demands of the labor market, 3) increasing employment opportunities for students, 4) improving the effectiveness of teaching and learning, 5) adapting to technological and societal advancements, and 6) optimizing resources.

1) Ensuring the quality of education: Conducting program assessments aids in evaluating the quality of higher education. Simultaneously, it determines whether the program aligns with educational goals and expectations of the academic community. This enables educational institutions and faculty members to assess the program's performance and make necessary adjustments to ensure that students receive a high-quality education. /

2) Maintaining connectivity and meeting the demands of the labor market: The program's learning outcomes represent the knowledge, skills, and attitudes that students are expected to achieve upon graduation. Surveys help ensure that these learning outcomes accurately reflect the current needs and requirements of the labor market. This, in turn, enhances employment opportunities for students after graduation and prepares them to work in a real-world environment with greater challenges.

3) Increasing employment opportunities for students: By ensuring that the training program aligns with the specified learning outcomes, universities enhance the likelihood of students securing employment upon graduation. This is because students are equipped with the necessary knowledge, skills, and attitudes required by employers

4) Improving the effectiveness of teaching and learning: Regular assessments and surveys help identify the strengths and weaknesses of the training program. This enables universities and faculty members to adjust and enhance teaching and learning methods. Additionally, it aids students in improving their academic performance and overall learning experience.

5) Adapting to technological and societal advancements: Society and technology are constantly evolving. Surveying training programs helps ensure that they are updated with the latest developments, enabling students to acquire the most current knowledge and skills.

6) Optimizing resources: By assessing the performance of the training program, universities can optimize resources by focusing on essential aspects and eliminating unnecessary factors.

3.8.2 Survey results

3.8.2.1 Interviewee information

There were a total of 90 stakeholders surveyed, primarily located in the Southern region (Ho Chi Minh City and surrounding provinces and the Northern region (Hanoi and surrounding areas), which have been analyzed. As shown in Figure 1, the surveyed stakeholders include those mainly involved in food-related businesses (approximatly 55%), as well as those in University (around 15%), research centers (12%), state management agency (11%), and other association (7%).
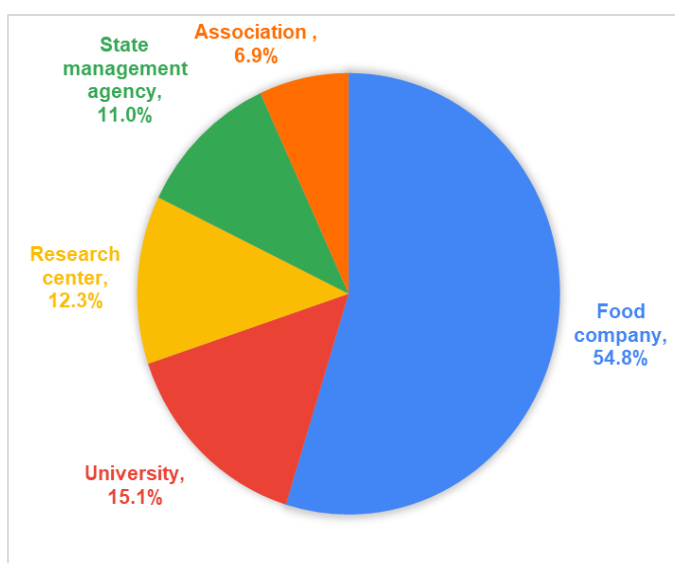

Figure 14. Type of organization

3.8.2.2 Knowledge blocks in the Quality Management - Food Safety program curriculum

Figure 15 illustrates the proportion of knowledge domains within the framework of the quality management and food safety program, encompassing general education (36-38%) and professional education (62-64%). Survey results indicate that over 82% of respondents agree with the proportion of professional education, but only 67% agree with the proportion of general education. The disagreement ratio regarding the allocation of courses within the general education group is significantly higher than that within the professional education group, specifically 7% and 2%, respectively. Additionally, survey results document positive contributions from stakeholders, indicating a diverse opinion on the distribution of course categories.
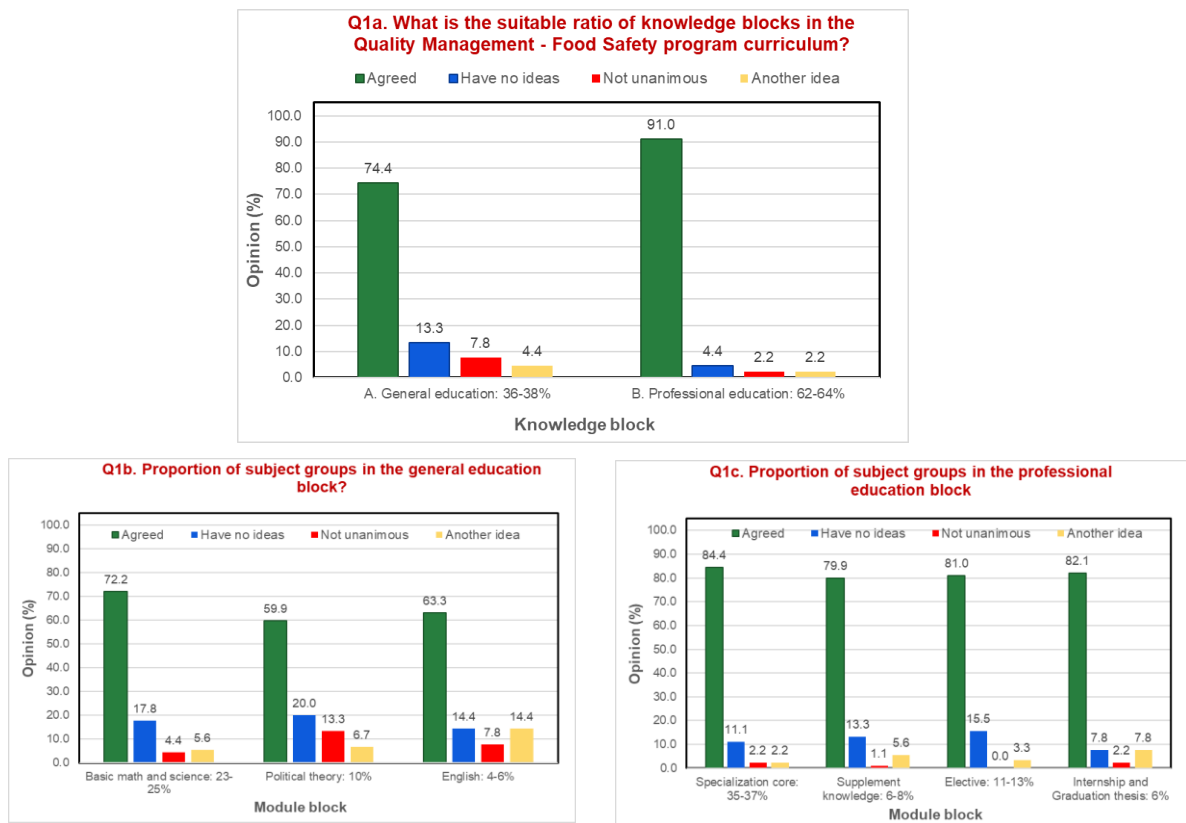
Figure 15. Knowledge blocks in the Quality Management and Food Safety curriculum

However, many suggestions propose a reduction in theoretical knowledge in political science, specifically decreasing the duration of political science and philosophy courses, while increasing foundational and core subject knowledge. Mathematics and basic sciences should only constitute 20% (a reduction of 3-5%), and internships and final projects should increase to 10-15%. Some opinions also highlight the need to incorporate elements such as presentation skills, writing skills, computer literacy, and especially English language proficiency into the curriculum. The English language component should be increased, setting TOEIC certification as a mandatory requirement, and certain specialized courses may adopt English-language presentations and report writing to enhance students' language skills. One explanation for strengthening skill-based courses, especially English language courses, is to

enable students to access additional knowledge beyond the classroom, fostering proactive learning and increasing opportunities and skills for future employment in international businesses.

3.8.2.3 Course providing Knowledge on Food Safety Hazards and Risks

Figure 16 presents the knowledge domains (courses) related to food safety hazards and risks. Survey results indicate that the majority of surveyed stakeholders exhibit high agreement (>80%) with the courses in the training program that provide knowledge about food safety hazards and risks. Notably, the courses on statistical analysis in food and physical analysis in food have agreement rates below 80%, specifically 74% and 78%. The lower rates for these two courses are attributed to a high percentage (10-11%) of respondents expressing "no opinion." The disagreement rates are generally low to very low (<5%), indicating a high level of consensus on the courses providing knowledge about food safety hazards and risks.
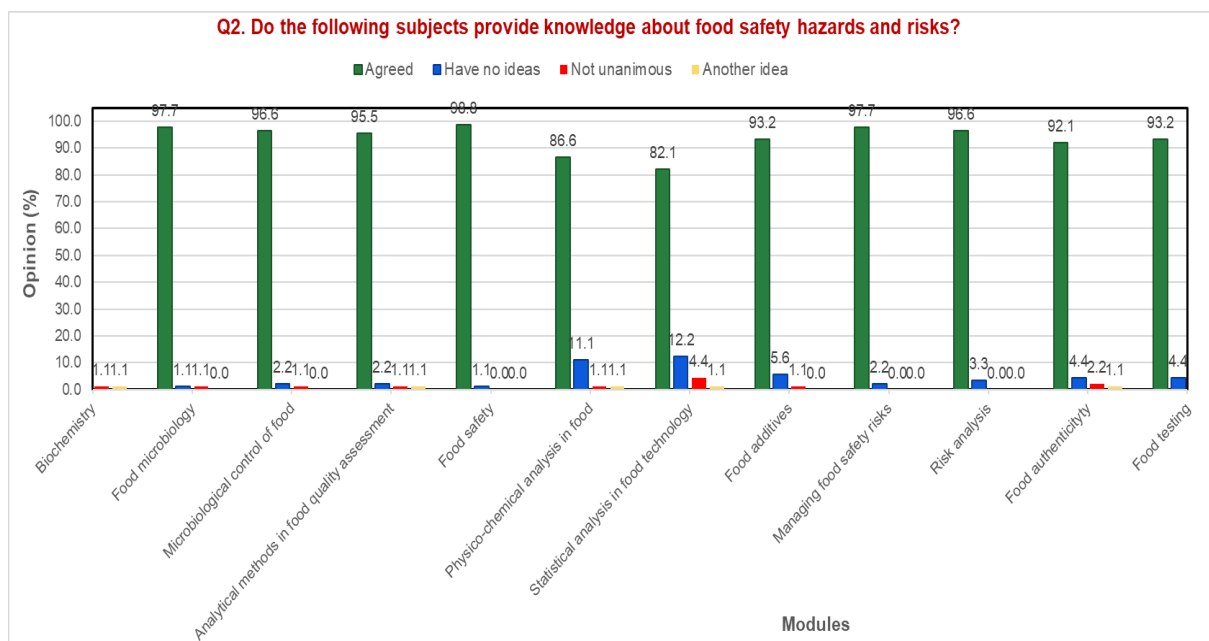
Figure 16. Courses providing knowledge in food safety hazards and risks

Additionally, there are suggestions for program improvement, such as incorporating more knowledge about food regulations, food traceability, food security, food packaging, chemical hazards, heavy metals, pesticide residues, veterinary drugs, growth promoters, mycotoxins, physical hazards (foreign objects from raw materials, equipment) and supplementing knowledge to understand and calculate Statistical Process Control (SPC) and Process Capability (CPK) indices in statistics

In summary, it can be observed that courses related to food safety hazards and risks receive consensus from stakeholders. There is a need to incorporate additional relevant knowledge into these courses, as suggested by the feedback.

3.8.2.4 Course Providing Knowledge on Supply Chain and Food System

The courses designed to provide insights into supply chain and food system are presented in Figure 17. Survey results indicate that the majority of stakeholders strongly agree with the proposed courses offering this knowledge (nearly 90%). However, a few opinions suggest adjustments to courses within this knowledge domain. Specifically, the supply chain and food system should not be limited to human nutrition alone, and the course on System Management and Quality Assurance should supplement knowledge on the supply chain of food products. This supplementation aims to provide an overview of the characteristics of various stages in the supply chain and recommend content on standardized systems, including standards applied along the food supply chain from farm to table (Organic, GLOBALG.A.P, ASC, BAP, HACCP, ISO, etc.), between system standards (HACCP, ISO, FSSC, etc.), and product standards (IFS, BRC, etc.). It is also suggested to cover standards for certain markets with specific requirements such as HALAL, Kosher.
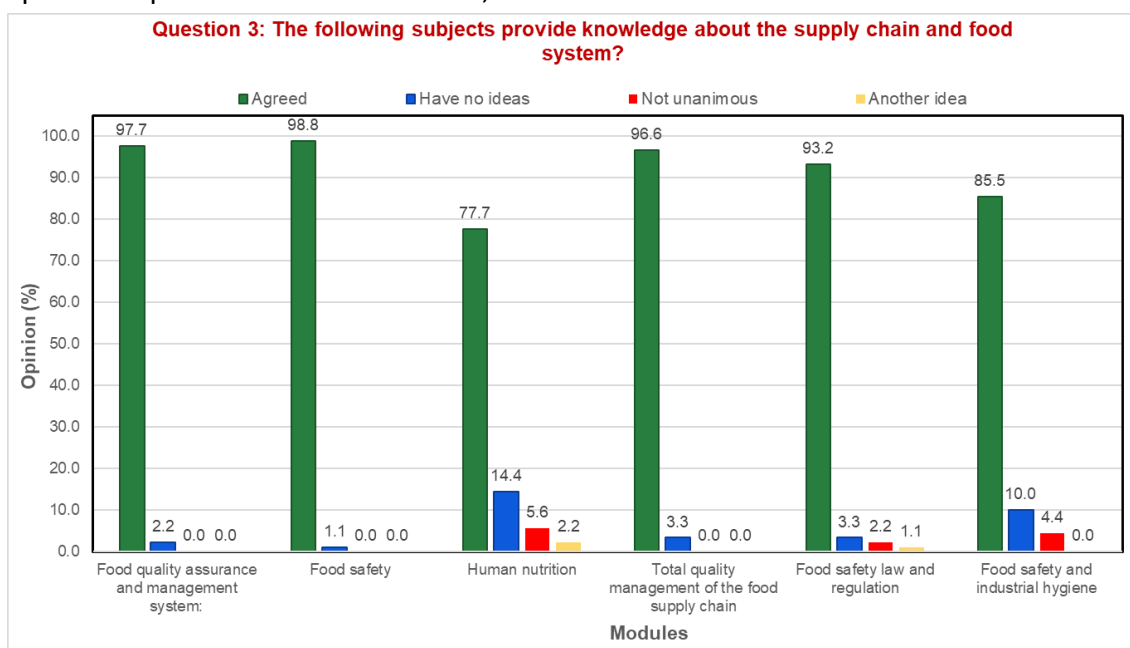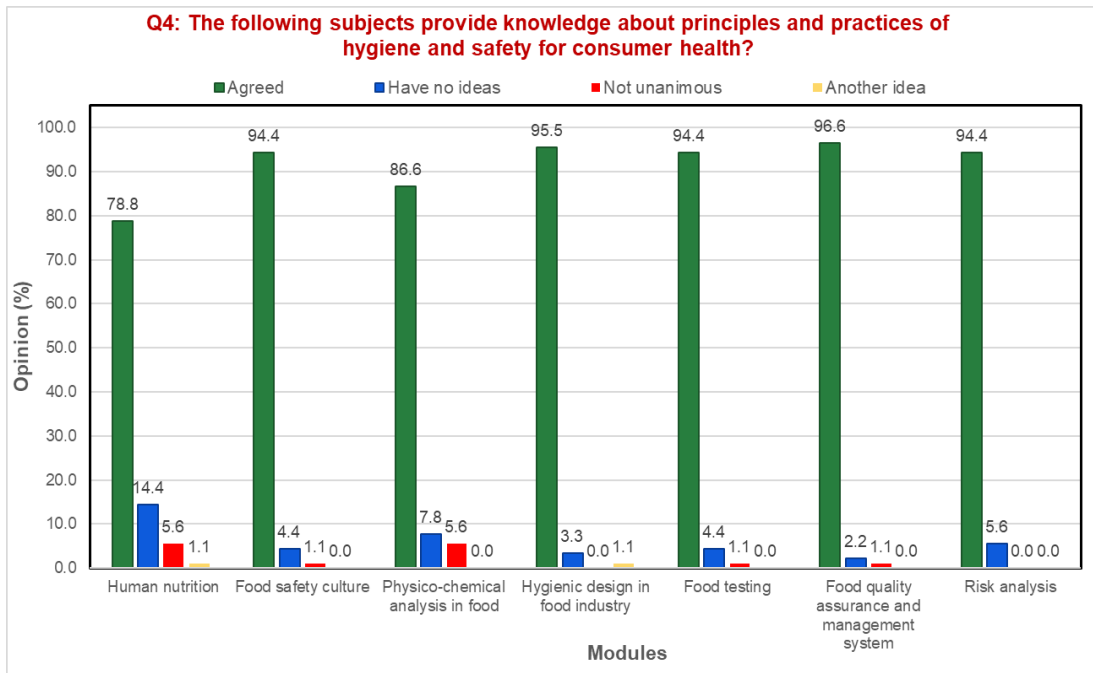

Figure 17. Courses providing knowledge in the supply chain and food system

Additionally, there is a proposal to include fundamental knowledge on Food Security and Fraud (currently present in FDA and GFSI standards), quality improvement tools (Kaizen, 5S, etc.), and stay updated on global trends related to Green Standards for Carbon Credits, Greenhouse Gas, ESG, and more.
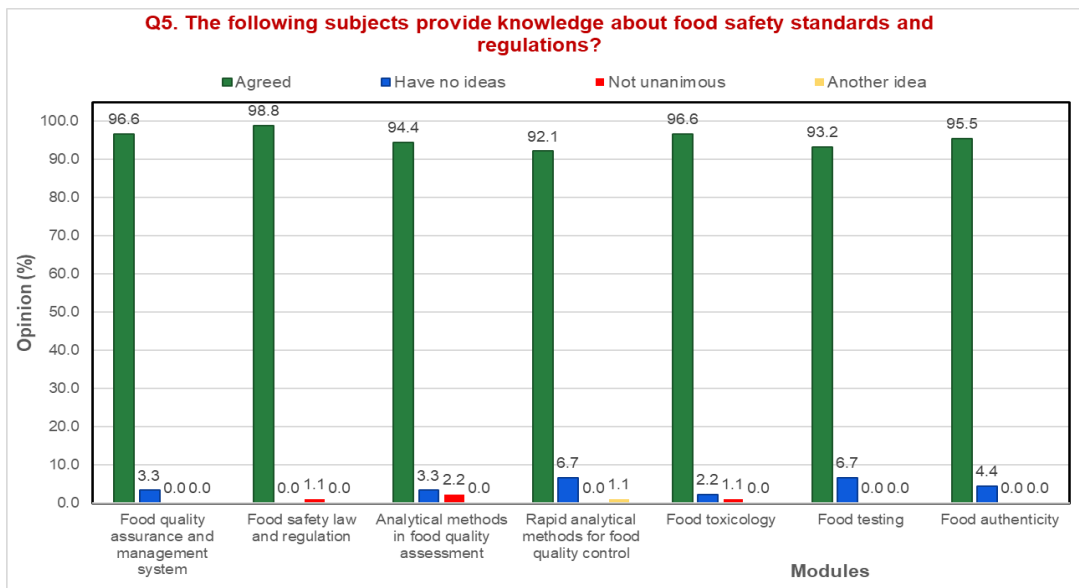
3.8.2.5 Course Providing Knowledge on Principles and Practices of Hygiene, Safety for Consumer Health, and Food Safety Standards

Figure 18A presents the survey results from stakeholders regarding the principles and practices of hygiene and safety for consumer health. The results show a relatively high agreement rate for courses related to safety and hygiene for consumer health (85-87%), except for the courses on human nutrition and the analysis of food chemical components,

with corresponding agreement rates of 71% and 78%. Some survey feedback on this criterion suggests that the HACCP analysis section needs to incorporate real-world internships for students to analyze a specific production line. This is because many students currently lack skills in HACCP analysis, quality control tools (7 QC tools), and hygienic design in the food industry, such as designing the layout of the factory according to the one-way principle to meet the conditions for food production. In addition, it is recommended to supplement content regarding the regulation of the use of food additives in the food law course.


(A)

(B)

Figure 18. Courses providing knowledge in principles and practices of hygiene and safety for consumer health (A) and food safety standards and regulations (B)

However, courses related to knowledge about food safety standards and regulations have received high agreement from stakeholders (83-89%). Some opinions suggest the need to supplement a course on "Hygienic Design in the Food Industry." Additionally, the labeling of food products is currently a significant concern for many businesses, and companies often make labeling mistakes. There are also upcoming regulations regarding nutritional labeling, and various penalties related to labeling. Therefore, this content should be updated in the relevant courses.

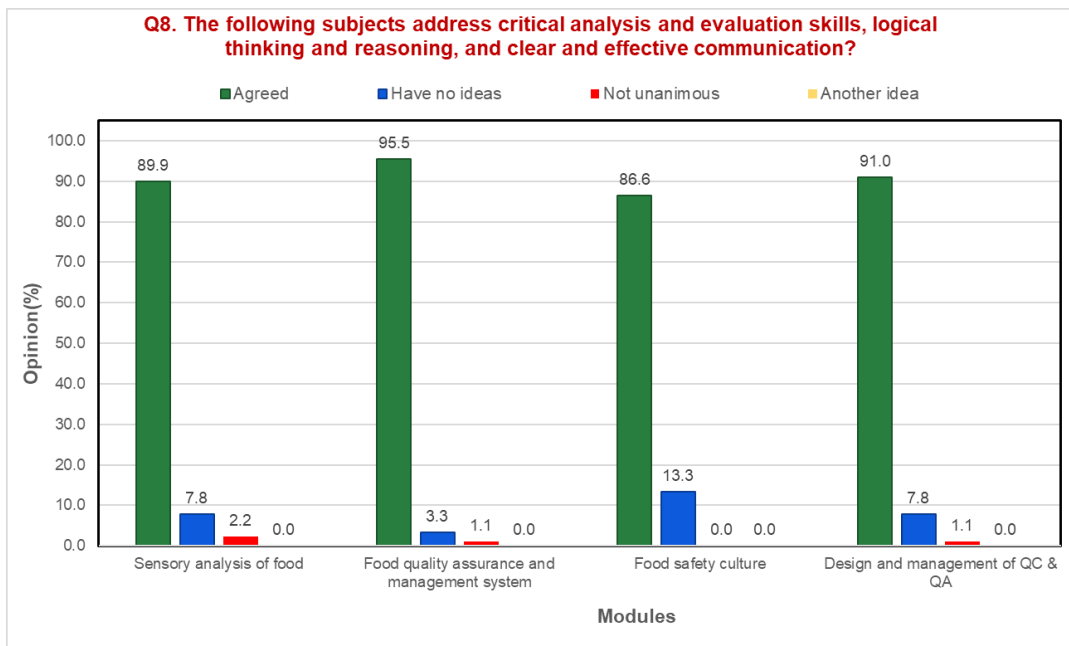### 3.8.2.6 Course providing knowledge on system analysis and food chain analysis

Figure 19 presents the survey results on courses that address (A) the ability to analyze a food system or value chain and assess potential risks to food safety; (B) the ability to propose appropriate solutions (risk management) for issues and challenges related to food safety; and (C) the ability to select, design, or implement tools and approaches to predict/ prevent/ detect/assess/control/respond/communicate food safety hazards and risks.
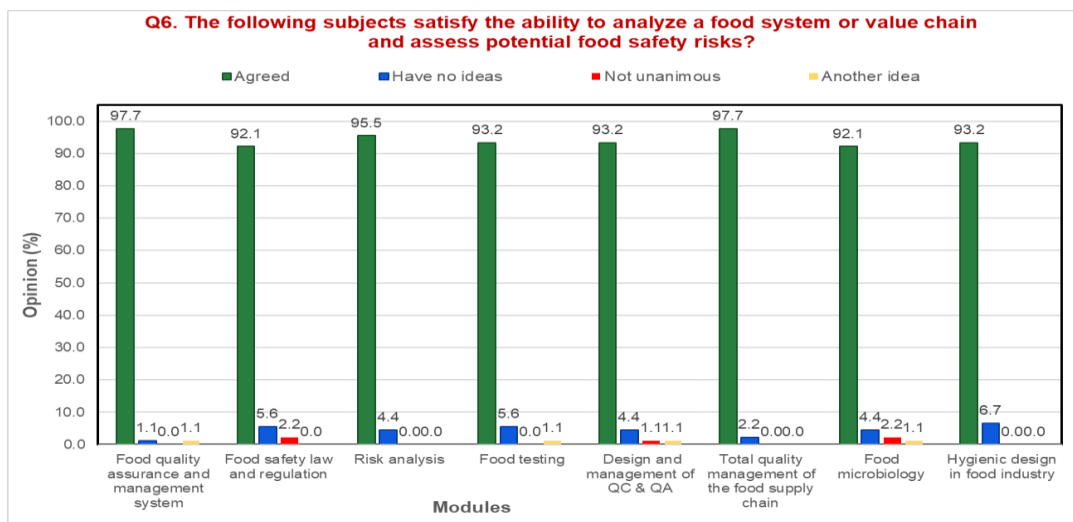
(A)
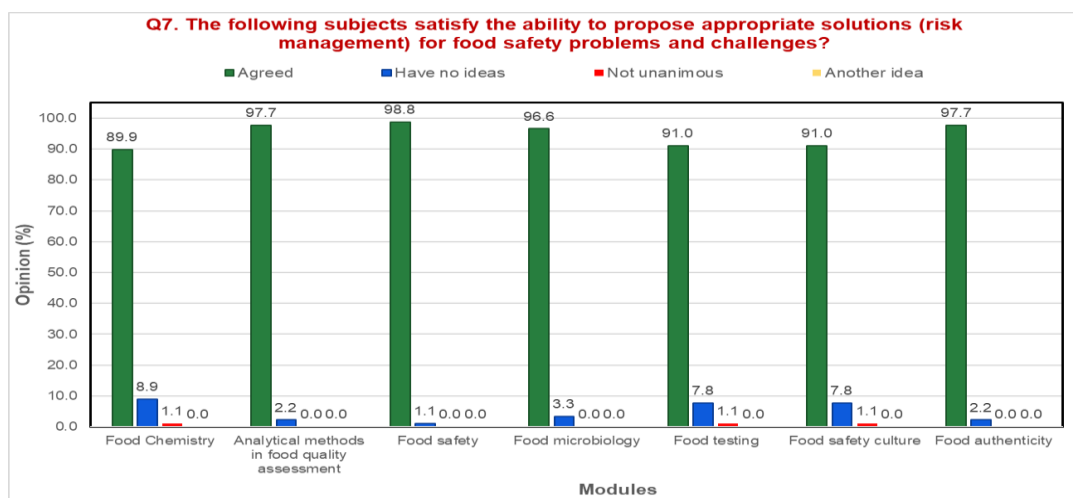
(B)

(C)

Figure 19. Courses providing knowledge related to system analysis and food chain analysis

In general, the survey results indicate that the majority of stakeholders fully agree with the proposed courses to address knowledge about the ability to analyze a food system or value chain and assess potential risks to food safety (Figure 19A); the ability to propose appropriate solutions for issues and challenges related to food safety (Figure 19B); and the ability to select, design, or implement tools and approaches to control food safety hazards and risks (Figure 19C). However, among the surveyed courses, the course on human nutrition has a relatively low disagreement rate (69%) (Figure 19C).

Prominent suggestions from the survey stakeholders include the incorporation of content covering the requirements of international Food Safety Management Systems such as ISO 22000 and FSSC 22000, or BRCGS (which already includes HACCP). The Legal Regulations section should provide knowledge on establishing methodologies, and setting limits in standards, and regulations.

In the Food Testing course, there should be a connection with the Microbiology of Food course, focusing on methods for testing pathogenic microorganisms. The Microbiology of Food course should concentrate on microorganisms causing diseases in food. There is a noted absence of courses on principles of hazards, chemistry, Food defense, and food fraud.

Especially, the Food Quality Management and Assurance system should be oriented towards training on how to establish a food safety system in a factory and how to apply that system in practice, avoiding discrepancies between the established procedures/documentation and actual practices. The training program should impart skills in building and applying a food safety system. Additionally, there should be courses on root cause analysis skills, utilizing tools such as fishbone diagrams, 5W1H, and trend analysis methods.

3.8.2.7 Course providing knowledge on analytical skills, problem solving, and effective communication

Figure 20 shows the survey results on courses that address (A) analytical and critical evaluation skills, critical thinking and logical reasoning, and clear and effective communication; (B) the ability to solve quality and food safety issues through typical case studies, extensive exercises, and specific real-life situations at businesses; (C) effective teamwork; and (D) the ability to communicate effectively with individuals and organizations.
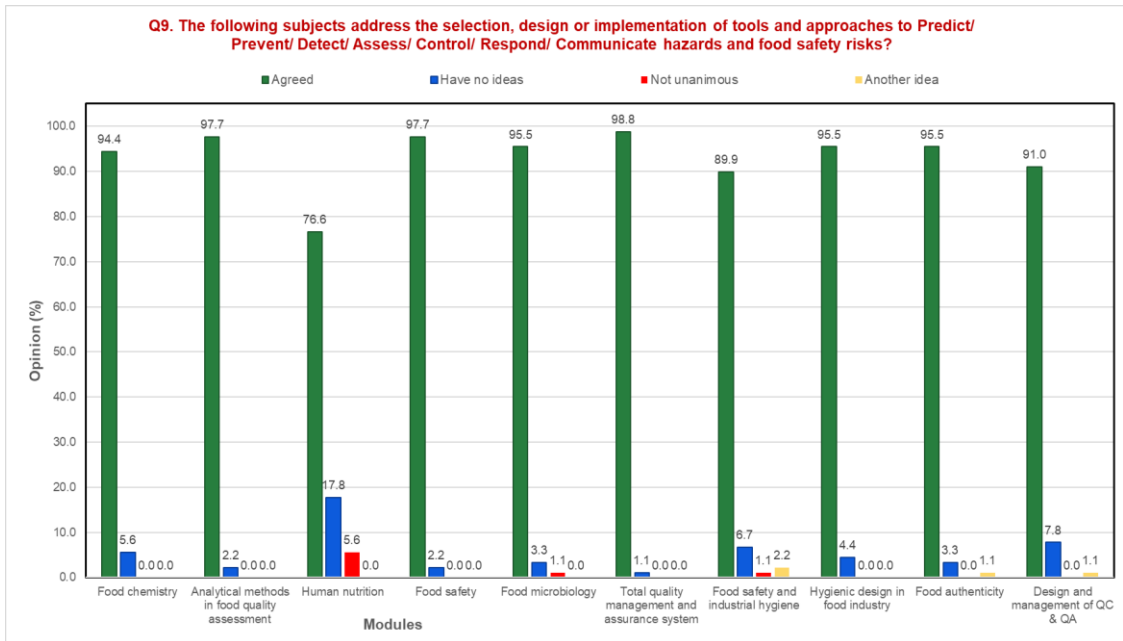
(A)
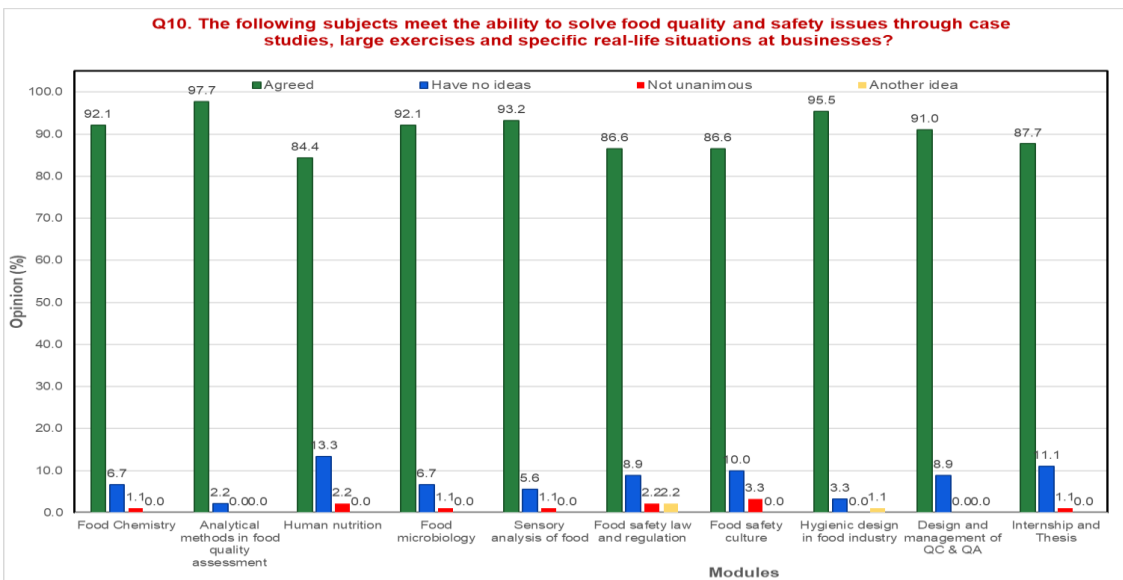
(B)
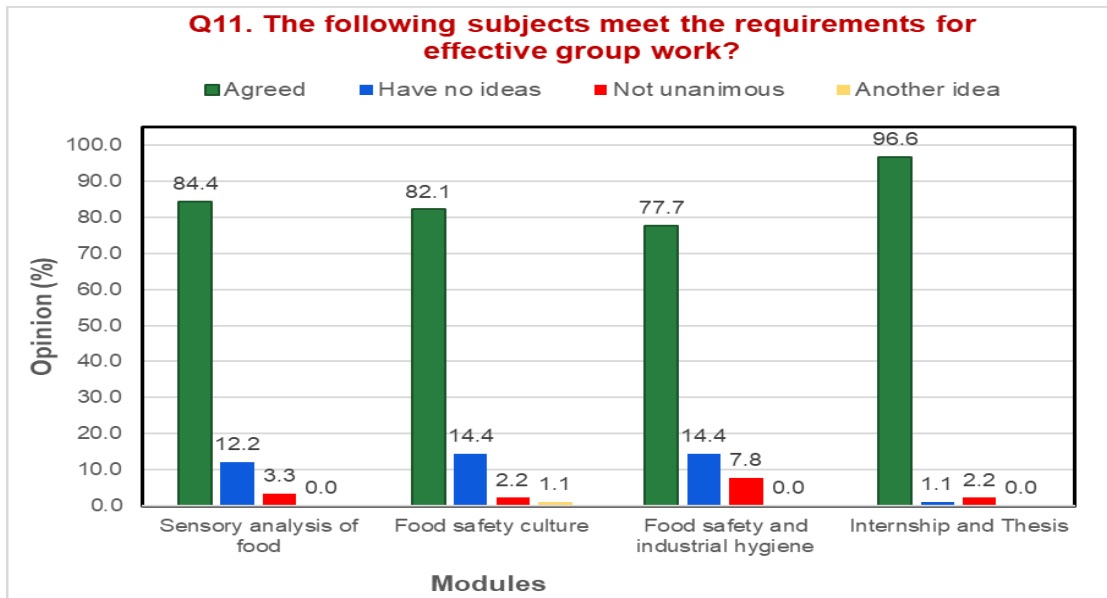
(C)

(D)

Hình 20. Survey results on courses related to providing knowledge on analytical skills, problem solving, and effective communication

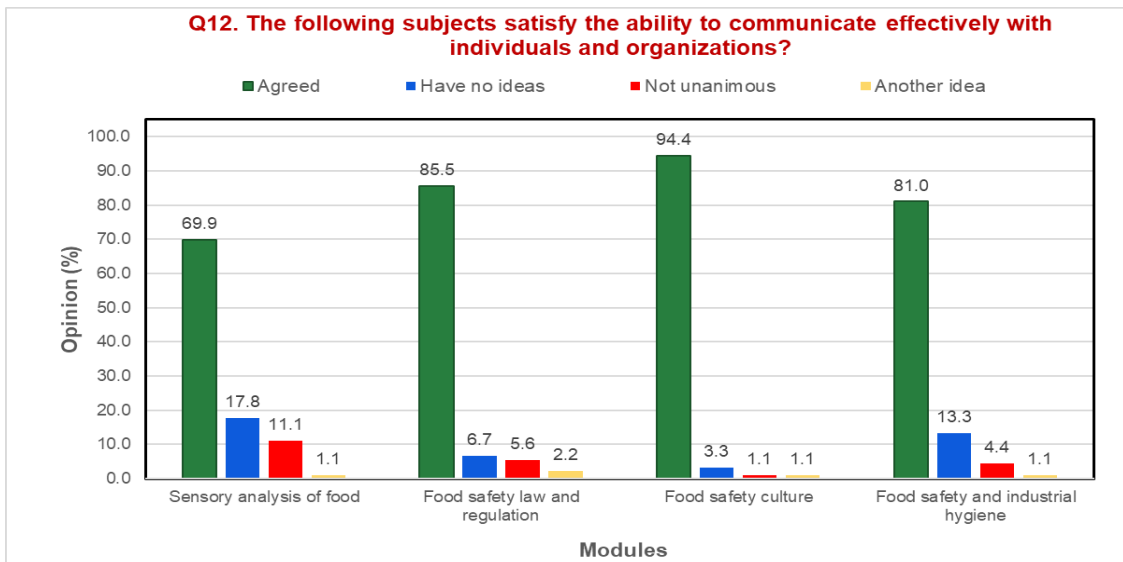In general, the survey results show a high percentage of agreement and disagreement (over 80%). Some survey feedback suggests the need to supplement courses or course content on risk analysis and hygienic design in the food industry. Additionally, critical thinking is not solely reliant on knowledge, especially in real production settings. It requires students to have an understanding of data collection, charting, and analysis based on data (e.g., problem solving, root cause analysis, etc.). Practical components should incorporate these skills, and the program should include additional courses on presentation skills and writing skills since effective communication requires practical experience. In reality, graduates often engage in quality assessment teams after completing their studies.

3.8.2.8 Course providing knowledge on the ability to demonstrate integrity, professional ethics, and respect for gender and cultural diversity in food safety

The results of Figure 21 illustrate the survey outcomes from stakeholders regarding (A) integrity, professional ethics, and respect for gender and cultural diversity and (B) the determination to cultivate and promote a food safety culture through all professional activities. The results indicate a high percentage of agreement and a significant absence of disagreement.
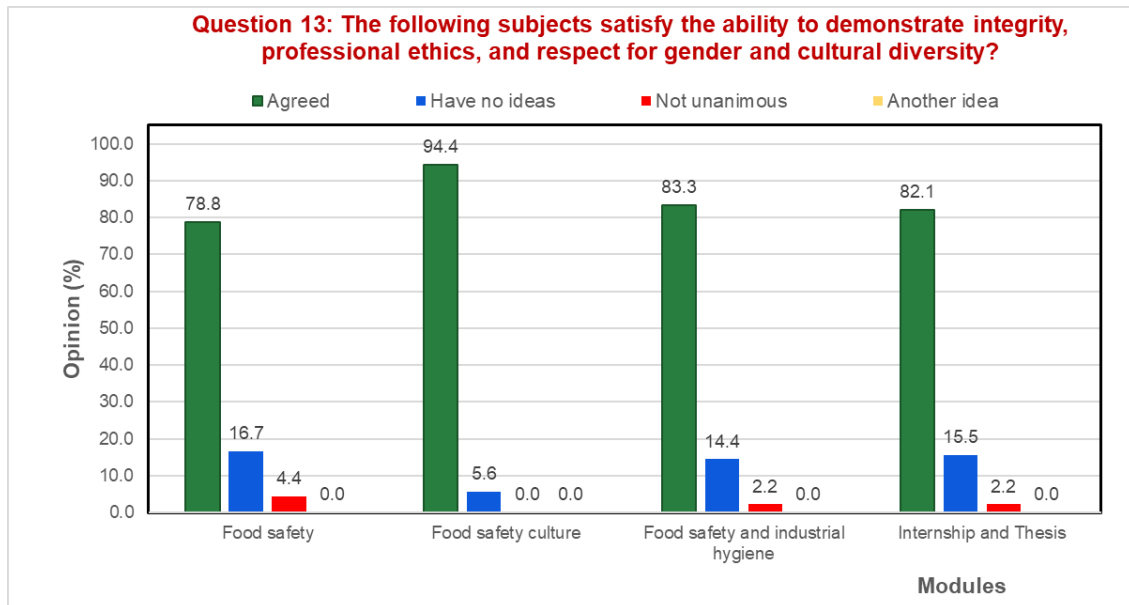
(A)
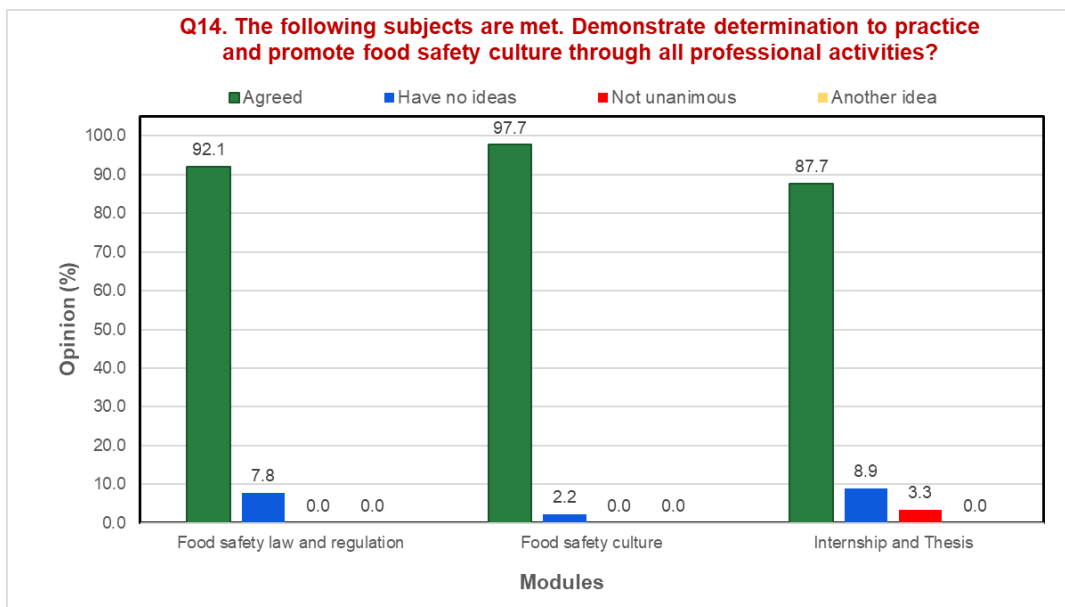
(B)

Figure 21. Survey results on knowledge related to the ability to demonstrate integrity, professional ethics, and respect for gender diversity (A) and a food safety culture (B)

The proposed opinions from stakeholders suggest the need to supplement courses in Human Nutrition, Risk Analysis, and Food Source Verification. Additionally, there is a requirement for a course on Laws and State Regulations on food safety, as well as the establishment of a Food Safety Management System in accordance with the requirements of Global Food Safety Initiative (GFSI)/FSSC/BRCGS.

3.8.2.9 *Course providing knowledge on technological changes, agricultural system transformations, and food safety threats*

Figure 22 presents the survey results on courses that address the willingness to pursue continuous education to assess technological changes, transformations in the agricultural system, and food safety threats. The survey results show a high percentage of agreement, exceeding 85%, regarding the inclusion of courses in this criterion.

The survey results indicate the need to supplement a course on Food Safety Culture, integrated with the corporate social responsibility of food processing and distribution businesses. Additionally, there is a requirement to add related courses such as Food Source Verification, Food Toxins, Legal Regulations on Quality Management and Food Safety, and the establishment of a Food Safety Management System following the requirements of Global Food Safety Initiative (GFSI)/FSSC/BRCGS. Furthermore, the legal regulations on quality management and food safety should be updated to incorporate new information and changes in quality management and food safety both domestically and internationally.

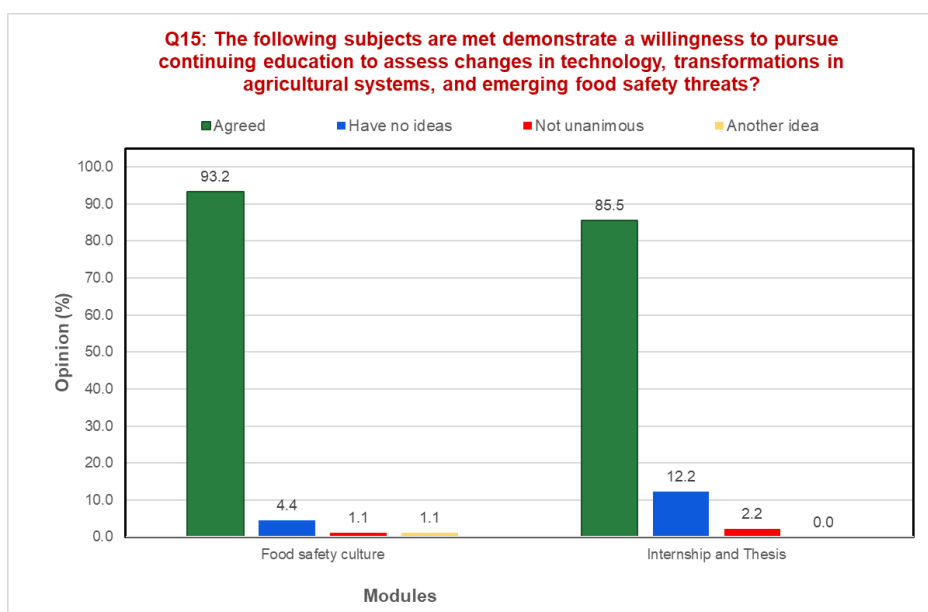**Figure 22. Survey results on knowledge provision related to the willingness to pursue continuous education to assess technological changes, transformations in the agricultural system, and food safety threats**

3.8.2.10   *General comments*

In general, the courses surveyed, whether offered by universities, research institutes, government agencies, or businesses, garnered high levels of agreement from stakeholders.

However, it is crucial to highlight that constructive feedback and suggestions concerning essential courses have been documented. These inputs will be carefully reviewed and taken into account for potential adjustments in the subsequent sections of this report.

3.9   Adjusting program curriculum

3.9.1   Summarized comments and explanation

Question number	Comment	Explanation	Remark
Q. 1	It is recommended to reduce general courses, reduce a small amount of political theory courses, and increase specialized courses.	Accept opinions on reducing general courses and increasing specialized courses. Univ. will review and balance these two blocks of knowledge based on existing programs. The amount of political theory knowledge is currently regulated by the Ministry of Education and Training, so it cannot be changed.	
	The rate for English courses should be increased.	Many students have now self-taught English and have international certificates. Increasing the proportion of English courses (which are mandatory) will cause difficulties for students who have had good results. Schools, in addition to the above number of foreign language credits, always encourage students to proactively study and recognize results. The school focuses heavily on specialized English.	
	The proportion of elective courses should be reduced and the proportion of projects and graduation theses should be increased.	Receiving comments, some univ. currently have internships and graduation thesis account for more than 20% of the number of credits. Therefore, only univ. with a low number of thesis credits will be considered for adjustment.	
Q. 2	Microbiology and biochemistry modules need to increase training time.	Microorganism modules are currently available in	

Question number	Comment	Explanation	Remark
		general microbiology, food microbiology, food safety, and food testing, so it is proposed not to increase further. The biochemistry module will be considered to increase the number of credits	
	Adding additional modules on Food Technology and Food Processing to provide basic knowledge about the processing process	Receiving opinions	
	The modules "Food quality assessment methods", "Applied statistics in food industry" can be transferred to question 4	Comment is acknowledged	
	The module "Control of microorganisms in food" does not have enough capacity to be separated into a separate module.	Comment is acknowledged and adjustments will take place in the syllabus	
	The module "Food additives" should be added because this is becoming a topic of concern because of many risks.	Comment is acknowledged and adjustments will take place in the program syllabus	
	The module "Food Packaging" should be added	Food packaging related to food safety is also introduced in the module Food safety and Risk analysis.	
Q. 3	The module "Quality management and assurance system" should have more information about the product supply chain to introduce more characteristics of the stages in the supply chain	Comment is acknowledged and adjustments will take place in the program syllabus	
Q. 4	The module "Food safety culture" should be integrated with corporate social responsibility.	Comment is acknowledged and adjustments will take place in the program syllabus	
	Some modules should be integrated, such as "Hygienic design in the food industry", integrating factory design according to one-way principles.	Comment is acknowledged and adjustments will take place in the program syllabus	
	The module "Quality control tools - 7 QC tools" can be added. The quality control tools section has been integrated in the module "Quality management and assurance system"	The quality control tools section has been integrated in the module "Quality management and assurance system"	
	The module "Quality management and assurance system", the HACCP analysis section needs to have additional exercises so that students know how to analyze a specific production line.	Comment is acknowledged and adjustments will take place in the program syllabus	

Question number	Comment	Explanation	Remark
Q. 5	The module "Document system..." should be replaced with the subject "Methods of constructing Vietnamese standard".	Currently, this module has introduced international document systems and Vietnamese documents, including a section on Vietnamese standard.	
	Học phần "Quality Management system…" cần có thêm thông tin về quy định ghi nhãn sản phẩm	Comment is acknowledged and adjustments will take place in the program syllabus	
Q. 6	The module "Legal documents" should provide knowledge in building methodology and building limits in standards and regulations.	Comment is acknowledged and adjustments will take place in the program syllabus	
	The "Food Testing" module needs to be linked to the food microbiology course, focusing on testing methods for pathogenic microorganisms.	Currently, the "Food Testing" module includes a hygienic quality (microbiology) testing section.	
	The module "Food Microbiology", focuses on the group of pathogenic microorganisms in food.	The current module "Food Microbiology" focuses more on the group of beneficial and spoilage microorganisms, with an introduction Briefly review disease-causing microorganisms. Pathogenic microorganisms are introduced in more detail in the module "Food safety"	
	The module "Food quality assurance and management system" should provide training in the direction of: how to build a food safety system at the factory, how to apply that system in practice, avoiding the construction of food safety systems. built on distinct processes/profiles and practices. The training program needs to train skills in building a food safety system and applying it.	Comment is acknowledged and adjustments will take place in the program syllabus	
Q. 7	The module "Food safety culture" should incorporate additional subjects on food supply chain assessment and social responsibility of food businesses.	Comment is acknowledged and adjustments will take place in the program syllabus	
Q. 8	The module "Risk Analysis" should be added.	Comment is acknowledged and the course is already existed	
	Critical thinking does not only rely on knowledge, especially in practical production, so it requires students to know: 1. How to collect data - data, 2. Draw graphs, 3. Analyze Based on data/tools (eg: problem solving, root cause analysis,....)	This information has been integrated into the modules	

Question number	Comment	Explanation	Remark
Q. 9	Should integrate more subjects such as HACCP, food supply chain assessment	Currently, this knowledge is available in the module "Quality management and assurance system", the module "Product supply chain management"	
	Need to add more modules "Analysis skills", root cause analysis tools such as fishbone diagram, SWOT tool, trend analysis, risk assessment	This method has been introduced in the module "Quality management and assurance system"	
	There should be practice at production facilities	Comment is acknowledged and adjustments will take place in the program syllabus	
Q. 10	The module "Food Safety Law" should be placed in the basic subjects for the entire major	Food Safety Law is already in the module "Regulatory Documents..."	
	The module "Food safety culture" can be expanded on consumer culture affecting food safety.	Comment is acknowledged and adjustments will take place in the program syllabus	
Q. 11	Need to increase practice time	Comment is acknowledged and adjustments will take place in the program syllabus	
	Should supplement knowledge related to QA-QC and establish a HACCP group or Food Safety Committee according to HACCP, ISO 22000		
Q. 12	The module "Food safety culture" should integrate the social responsibility of food processing enterprises	Comment is acknowledged and adjustments will take place in the program syllabus	
	The subject "Legal documents..." does not contain content that affects communication ability	Comment is acknowledged and adjustments will take place in the program syllabus	
	The key to effective communication is practice	Comment is acknowledged and adjustments will take place in the program syllabus	
	Addition of the topic "Group management and teamwork skills"	This section has been integrated into the modules	
Q. 13	Should add the modules "Human nutrition", "Risk analysis", "Food inspection" "Food tracability"	Comment is acknowledged	
Q. 14	The module "Legal documents..." should be set to the module "Laws and state regulations on food safety"	Comment is acknowledged	
	A Food Safety management system should be established according to the requirements of Global Food Safety Initiatives such as GFSI/FSSC/BRCGS	Comment is acknowledged	

Question number	Comment	Explanation	Remark
Q. 15	Additional courses: "Food origin inspection", "Food toxins", "Legal documents on food safety and quality management"	Comment is acknowledged	

3.9.2 **Point of ajusting**

Questions of the survey are divided in to 5 sections. Sections 1: Question 1 relatds to the ratio of knowledge block distribution in the program curriculum. Section 2 including question 2 to 5 concerned the distribution of knowledge. Section 3 from question 6 to questions 8 related to cognitive skills Section 4 from questions 9 to question10 related to practical skills. Section 4 from question 11 to 13 are for teamwork skills the final one ín question 14 and 15 asking behavioral attitudes of the learners.

High agreement has been obtained for the curriculum through the survey results, The comment, suggestion are mainly located in the content of the courses which will be developed in the syllabus at the next stage.

4 COMPLETE EXPECTED LEARNING OUTCOME AND CURRICULUM IN FOOD SAFETY AND QUALITY MANAGEMENT TRAINING PROGRAM

4.1 Completed results of ELOs for Bachelor and Engineer training program FSQM

4.1.1 Bachelor program

ELOs	Capacity
	A. Knowledge
ELO1	Understand of food safety hazards and risks
ELO2	Understand of food chains and food systems
ELO3	Understand of the practices and principles of food hygiene, health promotion and cleaning and sanitation
ELO4	Understand of food safety standards and regulations
	B. Skills
ELO5	Analyze (Understand) a food system or value chain and assess potential food safety hardzard assessment (for bachelor) and food safety risk assessment (for engineer).
ELO6	Propose tailored solutions (risk management) to food safety problems and challenges, taking into account multiple criteria and factors e such as effectiveness, acceptability, and implementability (risk management).
ELO7	Skills in critical analysis and evaluation, logical thinking and reasoning, and clear and effective communication.
ELO8	Understand methodology to choose, design, or deploy tools and approaches to Predict/ Prevent/ Detect/ Assess/ Control/ Respond/ Communicate food safety hazards and risk in food systems.
ELO9	Be able to solve food safety and quality issues through case studies, project based learning and real specific situation at the enterprise.
ELO10	Work effectively as part of a team.
ELO11	Communicate, orally and in writing, effectively individuals, organizations and groups with diverse backgrounds and experiences and perspectives, both in technical and lay terms.
ELO12	Demonstrate professional integrity, ethics, and respect for gender and cultural diversity.
	C. Attitude
ELO13	Show commitment to the practice and promotion of food safety culture across all professional activities.
ELO14	Demonstrate a willingness to pursue continuing education to stay appraised of changes in technology, transitions in agricultural systems and emerging food safety threats.

4.1.2 Engineer program

ELOs	Capacity
	A. Knowledge
ELO1	Understand and be able to analyze food safety hazards and risks.
ELO2	Understand of food chains and food systems.
ELO3	Understand and be able to apply the practices and principles of food hygiene, health promotion and cleaning and sanitation.
ELO4	Understand of food safety standards and regulations.
	B. Skills
ELO5	Be able to analyze a food system or value chain and assess potential food safety risks.
ELO6	Propose tailored solutions (risk management) to food safety problems and challenges, taking into account multiple criteria and factors e such as effectiveness, acceptability, and implementability (risk management.
ELO7	Demonstrate skills in critical analysis and review, logical thinking and reasoning, and clear and effective communication.
ELO8	Understand methodology to choose, design, or deploy tools and approaches to Predict/Prevent/Detect/Assess/Control/Respond/Communicate food safety hazards and risk in food systems.
ELO9	Be able to solve food safety and quality issues through case studies, project-based learning, and real specific situations at the enterprise.
ELO10	Work effectively as part of a team.
ELO11	Communicate, orally and in writing, effectively to individuals, organizations, and groups with diverse backgrounds experiences, and perspectives, both in technical and lay terms.
ELO12	Demonstrate professional integrity, ethics, and respect for gender and cultural diversity.
	C. Attitude
ELO13	Show commitment to the practice and promotion of food safety culture across all professional activities.
ELO14	Demonstrate a willingness to pursue continuing education to stay appraised of changes in technology, transitions in agricultural systems and emerging food safety threats.

4.2 Completed results of curriculum for Bachelor and Engineer training program FSQM

No	Modules	Credit (Bachelor)	Credit (Engineer)
General modules: 36-38%			

No	Modules	Credit (Bachelor)	Credit (Engineer)
1	Philosophy of Marxism and Leninism	3	3
2	Physical training 1	1	1
3	Introduction to Viet Nam Law system	2	2
4	Professional English 1	3	3
5	Political economics of Marxism and Leninism	2	2
6	Military training 1	3	3
7	Practical military training	3	3
8	Calculus 1	3	3
9	Physics 1	2	2
10	Physics 1 lab	1	1
12	General chemistry 1 lab	1	1
13	Physical training 2	1	1
14	Professional English 2	3	3
15	General English 1	4	4
16	Scientific Socialism	2	2
17	Calculus 2	3	3
18	Physics 2	2	2
19	Physics 2 lab	1	1
20	General chemistry 2	2	2
21	General chemistry 2 lab	1	1
22	Biological sciences 1	2	2
23	Biological sciences 1 lab	1	1
24	General English 2	3	3
25	Ho Chi Minh's thoughts	2	2
26	Probability and Statistics	3	3
27	Organic chemistry	2	2
28	Organic chemistry lab	1	1
29	Biological sciences 2	2	2
30	Biological sciences lab 2	1	1
31	History of Vietnamese Communist Party	2	2
	- **Specialization modules: 62-64%** - **Core foundation: 35-37%** - **Supplement: 6-8%** - **Elective: 11-13%** - **Internship and Graduation thesis: 8%**		
32	Food chemistry	4	4
33	Analytical methods in food quality assessment	2	3
34	Nutrition	2	2
35	Food safety	2	2
36	Food microbiology	2	2
36	Sensory analysis of food	2	2

No	Modules	Credit (Bachelor)	Credit (Engineer)
37	Food testing	3	3
38	Food quality assurance and management system	3	3
39	Food safety law and regulation	2	2
40	Food safety culture	2	2
41	Statistical analysis in food technology	3	3
42	Food marketing	2	2
43	Food additives	2	2
44	Microbiological control of food	3	3
45	Physico-chemical analysis in food	2	2
46	Risk analysis	3	3
47	Food toxicology	2	3
48	Internship	6	6
49	Thesis	9	
	ELECTIVE MODULE FOR ENGINEEE		
50	Work safety and industry hygiene		3
51	Rapid analytical methods for food quality control		3
52	Hygienic design in food industry		3
53	Food authenticity		3
54	Design and management of QC & QA		3
	……..		
55	Internship		**3**
56	Thesis		**15**
	Total	**120**	**150-180**

5 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

A curiculumn of undergraduate food safety curriculum (Bachelor or Engineer) has been developed from PLO survey to Matix and curriculum design based on the opinions from the stakeholders. This result was conformed with the training activities of the Food Technology/Engineering teaching program at HUST, VNUA and NLU, 3 most representative training orrganizations of the Food field in Vietnam from the North to the Sound of the country. The curriculum was also communicated with the international food safety experts currently undertaking similar work related to piloting international food safety curriculum.

The process of building the program curriculum was carried out through 02 surveys with more than 60 participants in each survey. The curriculum has introduced mandatory modules for the field of quality management and food safety at Bachelor's and Engineer's levels.

5.2 Recommendation

The Quality management and food safety curriculum needs to be put into practice at 03 Universities HUST, VNUA and NLU for a full cycle and have survey assessments from learners, teachers as well as employers to confirm the results of this project.

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