Paper ID 190: Qualification Framework for Human Resource Development through Competency Testing in Food Safety Sector

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INTRODUCTION

The Food Safety and Quality Management is rapidly gaining importance both at national as well as International levels due to various reasons *viz*. implementation of FSS Act 2006, globalization of food trade, harmonization of national standards with the Codex, legal changes on national and international levels etc. The Food Safety and Standards Act passed in the Parliament in 2006 came into force from 5th August 2011. To implement the act, there is a need for human resource at various levels involving different stakeholders in the food chain from farm (manufacturer) to fork (consumer) which includes Regulators (Designated Officers, Adjudicating Officers and Food Safety Officers), Food Auditors, Food Quality Analysts (Instrumentation/Microbiology/ Chemical), Food Handlers (Manufacturer, Wholesaler, Retailers etc.) and even Consumers (General Public, Children and Housewives) also. The Act calls for an enabling environment for its successful implementation and movement towards a science based approach to assure safety and the quality of food. The synergistic model of Qualification framework through Open and Distance Learning shall have marked and visible impact along with the acceptability and recognition across the globe. .

HUMAN RESOURCE DEVELOPMENT IN FOOD SAFETY SECTOR

Food safety is the responsibility of everyone in the food chain. The onus of safety of food products from procurement to sales covering- processing, import, distribution and sale lies with the food business operators across the globe. The Food Safety Acts through out the world empowers the consumers to take food samples and get it tested which in turn creates a need for creating awareness among the consumers and housewives about the food safety issues.

The Food Safety and Standards Act, 2006 in India redefines the role of food authorities and their functionaries to ensure access to safe and wholesome food nationwide. In India, the Food Safety and Standard Authority of India (FSSAI) and the State Food Authorities will maintain a system of control, involving risk communication, food safety surveillance and other monitoring activities covering all stages of food business.

One of the limitations in slow implementation of the Act is non-availability of trained human resource in large number. Hence, the development of human resource for the food safety sector has become a necessity for implementation of Act. In this backdrop, an educational framework has been proposed for discussion in the workshop focussing on the following target groups: (i) Food Processing Professional; (ii) Food Testing Professional and (iii) Food Safety Facilitator and Evaluator.

(i) ***Food Processing Professional:*** Under the new law in India, all the food business operators (FBOs), be it small or big, are held responsible for the supply of safe food to the consumers. All FBOs shall employ at least one technical person to supervise the production process. Similarly, the petty food manufacturer shall follow the basic hygiene and safety requirements provided in Part I of Schedule 4 of the regulations. Hence, India shall be requiring a large number of food processors/food handlers/managers/supervisors for handholding the food business operators who are competent enough to fulfil the requirements of the Act in providing safe food. There is a need for certification of food handlers for supporting the activities of the FBOs at various levels.

(ii) ***Food Testing Professional:*** As far the group is concerned, Food Safety and Standard Authority of India (FSSAI) shall be recognizing/ upgrading the food testing laboratories in the country to National Accreditation Board for Testing and Calibration Laboratories (NABL) standards to ensure analytical results are reliable and consistent. It also plans to notify Food Analysts. This

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shall result in a huge demand for the food quality analysts with expertise in food safety evaluation, and they ought to be competent enough to analyze the chemical, microbiological and physical parameters of food product composition and put the science based approach on fast track.

(iii) ***Food Safety Facilitator and Evaluator:*** The implementation of the Act shall also require a substantial number of food auditors at various levels to validate the adherence to the Food Safety Management System (FSMS) principles by the food business operators operating at different levels. The Regulations stipulates that the Registering Authority or any officer or agency specifically authorized for this purpose shall carry out food safety inspection/ food audit of the registered establishments at least once in a year. Ideally, an average of 10 Food Safety Officers (FSO) are required in each district and therefore, for 632 districts, about 6320 FSOs are required in India.

EDUCATIONAL FRAMEWORK FOR FOOD SAFETY SECTOR

Keeping view the above need, it was decided to develop an educational framework for food safety sector in order to meet out the human resource requirements. In order to develop this framework, experts from FSSAI, Government organizations, Academic Institutions, Food Industry, Private organizations in the field of food processing, chemistry, microbiology, instrumentation and food auditing were identified. A National Workshop was organized to develop the educational framework which will be based on the testing and certification mechanism. During the national workshop it was decided that there is a dire need for human resource development in all the three areas i.e. Food Processing Professional, Food Testing Professional and Food Safety Facilitator and Evaluator. A broad framework model was developed. The basic features of the framework were: competency based certification of the workforce/ professionals; level and type of competencies; training and educational programmes to achieve these competencies; wider access and equal opportunities to participate and make career for young graduates and experienced workforce and testing and certification framework in tune with the international structure. Later, three different groups for each category were formed in order to develop the complete educational framework containing Competency statement, knowledge and skill requirements for competency, Performance Standard and Assessment of Competencies. Accordingly, each group developed the curriculum/training Packages, delivery model, norms for training providers and institutional mechanism for testing and certification. The details are as follows:

The proposed Educational/qualification framework is as follows:

Levels	Target Group/Eligibility	Type of programme	Duration	Evaluation	Certification by
Food Processing Professionals					
0	Helpers/Self Entrepreneur	Training	3-4 hours	No	Training Providers
1	Semi-skilled workers	Training	8 hours	No	Training Providers
2	Skilled workers	Training	24 hours	No	Training Providers
3	Managers/ Supervisors	Training	40 hours	Yes	FSSAI approved certification body

Food Testing Professionals					
Chemical Testing	Graduate in Science with Chemistry or Biochemistry as one of the subject or B.Sc/ B.Tech. in Food Science/Food Technology/Dairy Technology or M.Sc in above mentioned subjects or M.Sc in Dairy Chemistry or equivalent	PG Diploma/ M.Sc.	One Year/ Two Years	Yes	Conventional Universities/ Educational Institutions/ IGNOU
Microbiological Testing	Graduate in Science with Microbiology or Biochemistry as one of the subject or B.Sc./B.Tech. in Food Science/Food Technology/Dairy Technology or M.Sc in above mentioned subjects or M.Sc in Dairy Microbiology or equivalent	PG Diploma/ M.Sc.	One Year/ Two years	Yes	Conventional Universities/ Educational Institutions/ IGNOU
Food Safety Facilitator and Evaluator					
Basic	Degree in Food Technology or dairy or biotechnology or oil technology or agricultural or veterinary or biochemistry or Microbiology of Master degree in Chemistry or Degree in Medicine from Recognized university	Training	6 days	Yes	FSSAI approved certification body

i) Food Processing Professional: In this group, there is a need for training at four different levels *viz.* Level 0 for Helpers, Level 1 for unskilled/semi-skilled workers, Level 2 for skilled workers and level 3 for Managers/Supervisors.

For Level 0, who are Helpers or grassroot level workers, there should be a 3-4 hours on-site training on basics of food hygiene and personal hygiene.

Parameters	**Level 1**	**Level 2**	**Level 3**
Target Group	Unskilled/Semi-skilled Workers	Skilled Workers	Managers/Supervisors
Eligibility	No formal education or Should be able to read and write with two years' experience in food establishment	Matriculate (10^{th} pass) or Should be able to read and write with two years' experience in food establishment	Graduation or Diploma with one year experience in food industry
Competencies	Follow work place hygiene procedures, Identification of unsafe practices, Proper storage of raw material and ingredients, Segregation of poor quality raw material, Removal of physical hazards, Use of Potable water and Ice for food preparation, Cleaning of equipment/utensils, Preparation/serving/storing	Follow and supervise competencies given for Level 1. The additional competencies may include: Identification and prevention of potential source of contaminants; maintain food safety while carrying out food preparation and handling activities for high risk foods, comply with personal	Development and sustaining FSMS, Handling food safety complaints, training skills, Ensuring food hygiene and safety aspects related to location and surroundings; Layout and Design of Food establishment; Equipment and

	food in clean and hygiene environment, Separate raw, cooked and finished products, Protect the raw and cooked food products from insects, pests and animals, trigger emergency/raise alarm in case of wrong happenings, disposal of rejected and waste in hygienic manner and Follow personal hygiene practices	hygiene standards; Handle, clean and store equipment, utensils, packaging materials and similar items according to the requirements of the food safety requirements-check for corners/ drains; Identify and report signs of pest infestation according to the food safety requirements; Check for waste collection, recycling and handling procedures relevant to own work responsibilities; process and store food in appropriate conditions to ensure its freshness, quality and appearance; Correct situations or procedures that do not meet the food safety requirements within the limits of work responsibility; understanding of food labels, handling of special foods and use of additives as per guidelines	containers; Facilities-water supply, drainage and waste disposal, personnel facilities and toilets, air quality & ventilation, lighting; food operations and controls; sanitation and maintenance and personal hygiene
Knowledge	• Basic knowledge on regulations • Basic knowledge on Food Hygiene and Safety (Safe food and water, personal and environmental hygiene etc.) • Basic understanding on the food hazards and their impact on human health and methods of prevention • Working knowledge on personal and environmental hygiene • Basic knowledge on contamination, handling of raw materials, finished product and waste materials. • Operational aspects of cleaning, sanitation and pest control	• Aspects covered in Level 1 • Basic knowledge of regulatory framework on is operations • Knowledge on food safety (FIFO/FEFO/GHP/ GMP etc.) • Knowledge on food preparation/ storage equipment. • Nitty-gritty on procurement, handling and storage of raw material • Knowledge on pre-preparation, preparation, processing and presentation of finished product • Working knowledge on handling, storage and reuse of finished products • Understanding on food spoilage, contamination and food-borne illnesses • Understanding on waste disposal • Knowledge about food	• Aspects covered in Level 1 and Level 2 • Clear understanding on food quality, food safety, food safety and quality management, food laws and standards, regulations • Thorough knowledge on food contaminants and its prevention • Knowledge on different packaging materials, labelling, storage and transportation of raw materials and finished products • Knowledge about risk analysis, surveillance, product recall, traceability

		additives, adulterants and special foods	
Skills	• Communication and reporting skills • Interpersonal soft skills • Identification and reporting of unsafe practices • Ability to perform the personal and environmental hygienic practices • Ability to clean and sanitize of workplace as well as surroundings • Ability for good housekeeping • Ability to dispose waste and spoiled food	• Aspects covered in Level 1 • Interpersonal soft skills • Ability to procure (quality), handle and store raw materials • Perform preparation and processing activities as per GMP • Ability to effectively handle, store and reuse finished products • Identification appropriate packaging material, proper storage and transportation of finished products • Ability to identify adulteration, spoilage and contamination of food	• Aspects covered in Level 1 and Level 2 • Ability to guide and manage the organization on food safety issues • Ability to identify and rectify gaps in the food chain • Ability to arrange required resources • Liaison with different food regulation bodies • Ability to impart training and sustain the system

ii) Food Testing Professional: In this group, there is a need for educational programme of one year duration on two different aspects *viz*. Chemical Analysis and Microbiological Analysis.

Parameters	**Chemical Testing**	**Microbiological Testing**
Eligibility	Graduate in Science with chemistry as one of the subjects and 1 year experience in food analysis or B.Sc/ B.Tech. in Food Science/Food Technology or post graduate degree in relevant subject	B.Sc. Microbiology or B.Sc./B.Tech. in Food Science/Food Technology or post graduate degree in relevant subject.
Competencies	Ability to undertake: • Proximate analysis, physico–chemical and residue analysis • Sensory evaluation, testing of adulterants and contaminants • Preparation of standard solutions • Calibration of different measuring glassware and instruments • Development of protocols for analysis, method validation and data interpretation	Ability to undertake: • Microbiological analysis of food products • Competencies in operation and handling microbiological equipment, techniques, process and data interpretation • Sterilization of glassware, media and sub-culturing • Application of advance techniques • Standard methods of analysis • Sampling and data interpretation
Knowledge	• ISO-17025 and food laws, regulations and standards • Principles and techniques of physico-chemical and proximate analysis • CRM & SRM • Sampling, standard preparation and storage of reagents • Understanding standard methods of residue analysis • Introduction to trace analysis and introduction to advanced instrumental techniques of	• Food laws, regulations and global food safety standards, HACCP • Asepsis and sterilization, storage and maintenance of glassware • Sampling, sample attributes and microbiological criteria • Standard/media preparation and storage of reagents/media • Standard methods of microbial analysis • Indicator microorganisms • Knowledge on Lab accreditation, Method validation, Uncertainty measurement, Inter-laboratory testing, Proficiency testing

	analysis such as GC, HPLC, GC-MS, LC-MS, AAS, ICP, ICPMS, Visual and infrared spectroscopy • Waste (including toxic) disposal	• Basic knowledge of hygiene and sanitation • Waste disposal and biosafety issues • Understanding of document control and record keeping • Introduction to GM foods
Skills	• Preparation and use of SOPs • Ability to prepare standard solutions, sampling and sample preparation • Ability to perform physico-chemical and proximate analysis • Ability to perform sensory evaluation of different food products • Sample preparation, extraction and clean up procedures to perform residue/trace analysis • Interpretation of results/data • Internal Auditing • Ability to handle instrumental techniques of analysis such as chromatographic and mass spectrometric techniques	• Preparation and use of SOPs • Ability to prepare standard solutions, sampling and sample preparation • Ability to maintain cultures (sub-culturing) • Ability to perform detection of various microbes/pathogens • Handling, calibration and maintenance of measuring glassware, instruments and equipment • Precision in microbial analysis • Interpret the results/data and draw the inferences • Internal Auditing • Application of HACCP decision tree and CCP identification

iii) Food Safety Facilitator and Evaluator: Here, human resource should be developed through short-duration training programmes at two levels *viz.* Basic and Advanced to work as facilitator for the small scale and/or as auditor for the medium and large industries.

Parameters	**Basic**	**Advanced**
Eligibility	Diploma (Post Secondary)/ Degree in Science	Graduate in Food Science & Technology or related areas (like Ag. Sciences, Veterinary Sciences, Food Nutrition
Personal Attributes	Basic	Basic
Language Proficiency	Proficient (S/R/W) in English and at least one national language	Proficient (S/R/W) in English and at least one national language
Competency	• Basic level professionals – focus on GMP/GHP • Guidance /Auditing against national regulatory requirements and Codex standard	• Provision of adding scope to their competence based on acquiring sector specific skills like Meat, Dairy, Catering/Services etc. • Guidance/ Auditing over and above the national regulatory requirements like HACCP, ISO 22000, Importing Country requirements etc.
Knowledge	• National food laws and regulations • Fundamental knowledge of food science and basics of food hygiene • General Principles of Food Hygiene (CAC/RCP-1) and Food Safety • Food Sector terminology • Basic knowledge on GMP & GHP • FSS Act & Regulation, Licensing/ Registration requirements for FBOs	• All under Level-I plus • Sector specific product / process standards- National & International • Food Safety hazards and risk analysis • Sector specific knowledge of hygienic and sanitary practices, hazards, control to manage hazards, contaminants, allergens • Product specific regulatory requirements of importing country.

Skills	Good Communication, Training and Auditing skills	Good Communication, Training and Auditing skills

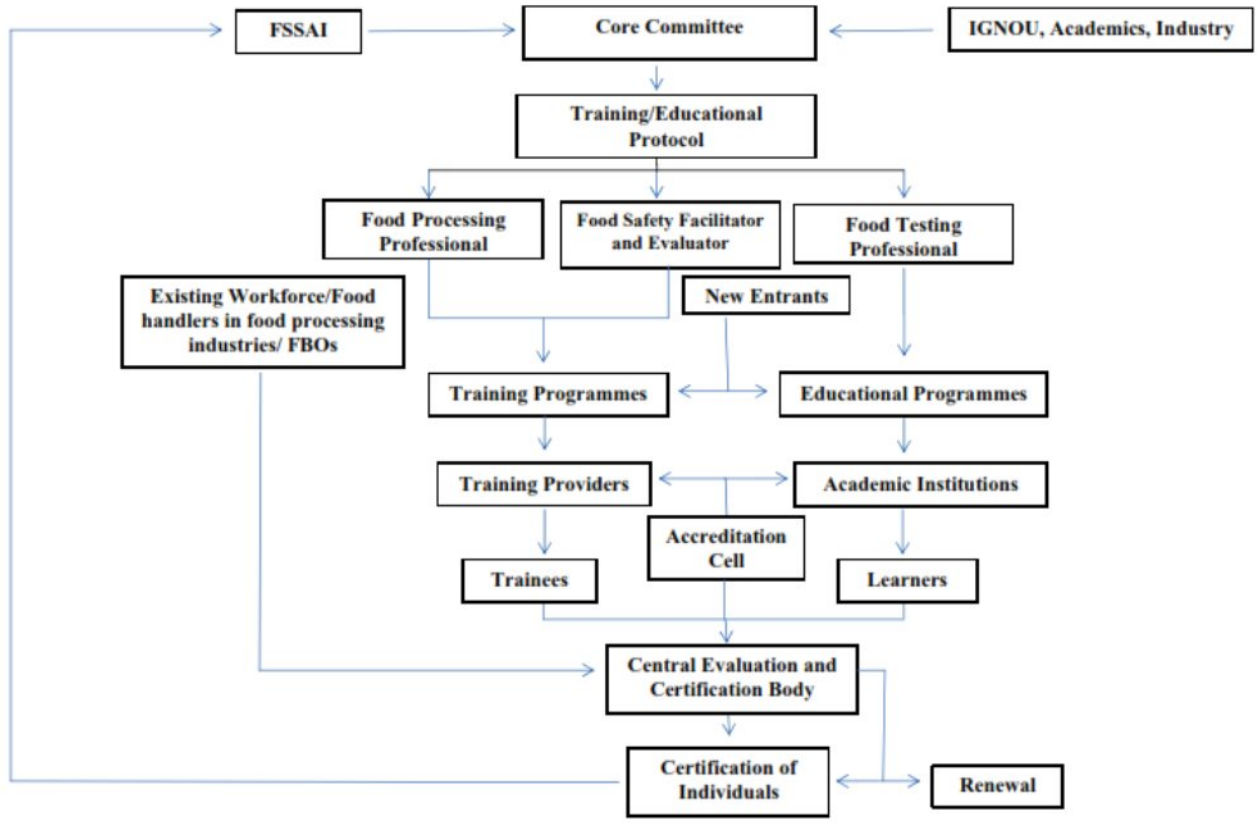
COMPETENCY BASED CERTIFICATION MODEL

A competency based certification model was developed for two groups *viz*. Food Processing Professional and Food Safety Evaluators and Facilitators. In this model, for food processing professionals, equal opportunity is given to both new entrants as well as the existing workforce. New entrants will undergo training in the training centres and will appear for competency testing and evaluation. Whereas, the existing workforce, can directly appear for the competency testing and evaluation. For food testing professionals, it is proposed to develop and implement a PG Diploma programmes through both conventional mode through Universities and Open and Distance Learning (ODL) mode in two subjects *viz*. Microbiological testing and chemical testing. The testing and evaluation methodology will be as per the concerned institution procedure.

The training will be provided Training Providers (TP) which may include Academic institutions/private organizations/industry/ NGOs with the requisite infrastructure and faculty. The human resource developed shall be certified through a national level testing and certification mechanism based on the competency statement and performance criteria. For testing and certification, it is proposed to establish a Central Testing and Certification Body which will perform the dual role of competency testing and certification of the trainees.

PROPOSED IMPLEMENTATION MODEL

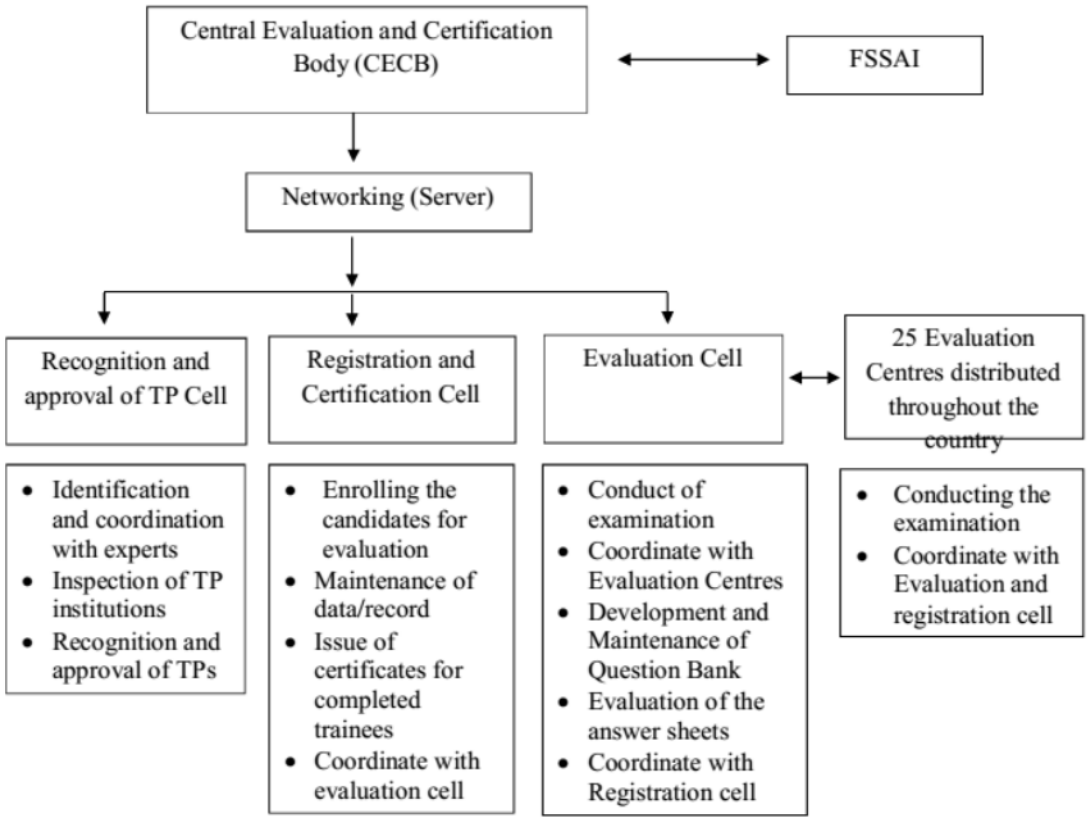
A National Board on Food Safety is proposed for implementation of this qualification framework for human resource development through competency testing. The following implementation strategy is proposed for different categories:



i) Food Processing Professionals and Food Safety Facilitators and Evaluators

Training will be the responsibility of training providers. Training Providers will be responsible for registration of the trainees. Based on the approved curriculum for each level, Training Providers will organize the training programmes for different levels of the Food Processing Professionals. Testing and evaluation will be done only for Level 3 through Central Evaluation and Certification Body (CECB). Training Providers (TP)/Educational Institutions will be evaluated and accredited every 3 years by an Accrediting cell under CECB for maintaining the quality/standards. CECB established for the Food Processing Professionals category will conduct the examination once in 3 months throughout the country through their evaluation centres. The candidates who are interested to appear in the examination (competency testing) should submit their examination form along with the prescribed exam fee to the evaluation centre of the CECB. CECB will be responsible to declaration results and certification of the successful candidates. Every certified candidate should reappear and clear the examination for renewal of his/her certification every three years. It is also proposed to revise the curriculum for both the groups every three years or as per the need.

The mechanism of evaluation and certification is depicted below:



ii) Food Testing Professionals

The implementation of these educational programmes could be of two models – distance learning mode (IGNOU programme) or regular mode (Conventional universities). In distance learning mode, the training providers can be any NABL accredited food testing laboratory which will provide the theory and practical counselling and IGNOU will be evaluating and certifying body. In case of regular mode, the educational institution/university which will be offering the PG Diploma will perform the dual role of counselling and evaluation and certification. Educational Institution who will be offering the educational programmes will be responsible for registration of the candidates. Based on the approved curriculum for each categories *viz*. Chemical analysis and microbiological analysis, they will offer educational programme. The educational institute will be responsible for evaluation and certification as per the concerned educational institutions norms.

National Vocational Education Qualification Framework in India (NVEQF): The Government of India has approved a National Vocational Education Qualification Framework to stimulate and achieve the targets set under the National Skill Mission. The key elements are: (a) Unified national approach for linking academic and workplace standards; (b) Explicit reference points using learning outcomes, level descriptors, benchmarks (National Occupation Standards), and qualification descriptors; (c) Recognition of Prior Learning (RPL); (d) Flexible learning pathways - more choices for combination of courses and credit accumulation and transfer facility and (e) Provisions for horizontal and vertical mobility (Mehrotra, 2012). The pedagogical key features are: (i) development of Competency Standards for lower, intermediate and higher levels of skill, keeping in view the occupational structure and classification; (ii) certification for learning and achievements; (iii) quality Assurance regime facilitating the portability of skills and labour market mobility; and (iv) open and flexible system which will permit competent individuals to accumulate their knowledge and skill through testing & certification into higher diploma and degree. The important issues shall be proper implementation of the framework and issues are: benchmarking of informal sector occupations, rationalizing the comparability of general educational and vocational qualifications at appropriate level, harmonizing the educational gaps at an occupation level across the country, infrastructure for skill development and driving force for having the qualification certification.

ODL Interventions in assessment and certification: Open and Distance Learning (ODL) system can play an instrumental role in mounting the qualification framework because of its inherent characteristics such as open access and open pedagogy. The system is also attaining central place in addressing education and training requirements due to its good compatibility with new technologies. The steady growth of Information and Communication Technology (ICT) and progressively improvement in pedagogical and administrative models are facilitating learning at a distance. Features like capacity to train large number of people in a cost effective way, flexibility in curriculum, standardized educational packages, individualized pacing and objective assessment make it a competitive system for human resource system. ODL is a good facilitator for informal mode and can also be a bridge between formal and informal mode of education. These strengths make the ODL to provide a doable model in implementing the qualification framework. The interventions could be on following components:

i) Standardization of curriculum and development of instructional material for different levels of qualifications
ii) Implementation of the programmes in ODL mode at national level at the Academic Institutions – formal as well as non-formal, Industrial houses/ Training institutions
iii) Accreditation of Institutions
iv) Certification

The implementation of the qualification framework will require addressing the following issues:

i) Curriculum and study material:
    a. Development of curriculum for large and heterogeneous target group at different levels
    b. Building Horizontal and vertical mobility
    c. Providing flexibility and making it learner-centric
    d. Integrating industry requirements in the curriculum
    e. Choice of appropriate media depending upon the target group
    f. Transformation of self-instructional material to multimedia packages
    g. Catering to the local/regional needs
    h. Validation of contents and self-instructional materials
ii) Implementation:
    a. Identifying the appropriate institutions as training providers
    b. Monitoring of training providers and Quality Assessment of training programmes delivered by them
    c. Coordination among the units involved in implementation process
    d. Participation of industry in implementation process
    e. Ensuring quality and timely learner support services
    f. Creating awareness and motivating the potential learners for popularizing the programme
    g. Developing a uniform calendar for delivery of programmes
iii) Accreditation:
    a. Ensuring the quality of the training providers
    b. Coordination with the training providers
iv) Testing and certification:
    a. Systems and modalities for conducting the test
    b. Development of Performance standards
    c. Empanelment of Experts as National Evaluators and their periodic orientation and training
    d. Ensuring the quality of evaluating the Performance criteria of the learners by training providers
    e. Establishment of central testing and certification body and ensuring its operations
    f. Ensuring timely testing and certification of learners
    g. Creating linkage of central testing and certification body with industry

An action research study needs to be undertaken for implementation of qualification framework through Open and Distance Learning for standardizing the system and modalities. The proposed framework for the food safety sector will provide valuable pedagogical inputs. This shall involve “Standardization of competencies, curriculum, development of self-learning instructional material,

guidelines for accreditation of training institutions and emplanement of experts, evolving of performance standards at different levels and testing mechanism for certification through ODL system. The strength and credibility of the proposed framework lies in its ability to have a universal coverage across the sector and ensure the quality through its innovative and flexible strategies. The synergistic model of Qualification framework through Open and Distance Learning shall have pronounced and visible impact since 'learning throughout the life' and 'technology-based teaching/learning' have been recognized as the new portals of education and training. The diversification into new areas/ student groups and quality control measures would be necessary to sustain the current growth rate and achieve the set targets. It is a challenge for the educationists to work out the modalities for successful implementation with an objective for national and international acceptability.

SUMMARY

Food safety is the need of the hour. To implement the Food Safety and Standards act, there is a need for human resource in short time at various levels involving different stakeholders in the food chain from farm to fork. Human resource development in Food Safety Sector in the categories of Food Processing Professional, Food Testing Professional and Food Safety Facilitator and Evaluator should be given top priority. The focus should be on development of required competencies based on the level of activities performed by these people/group in the food chain. The human resource in different categories will be developed through training programmes except for Food Testing Professional which will be an educational programme. In the Food Processing Professional group, there is a need for training at four different levels *viz.* Level 0 for Helpers, Level 1 for unskilled/semi-skilled workers, Level 2 for skilled workers and level 3 for Managers/Supervisors. In Food Testing Professional group, there is a need for educational programme of one year duration on two different aspects *viz*. Chemical Analysis and Microbiological Analysis which can be offered through conventional mode or open and distance learning mode. In Food Safety Facilitator and Evaluator group, human resource should be developed through short-duration training programmes at two levels *viz.* Basic and Advanced to work as facilitator for the small scale and/or as auditor for the medium and large industries. A competency based certification model is proposed. Human resource shall be certified through a national level testing and certification mechanism based on the competency statement and performance criteria. The training/educational programme will be offered through the Training Providers (TP)/Educational Institutions which may include Academic institutions/private organisations/industry/ NGOs with the requisite infrastructure and faculty. A Central Testing and Certification Body will be formed which will perform the dual role of competency testing and certification of the trainees. A National Board on Food Safety is proposed for implementation of this qualification framework for human resource development through competency testing. The Open and distance learning system can play an important role in implementation of the framework by forming a link between the conventional education system and industry. The collaborative model based on the inherent strengths of ODL mode shall have tangible impact in giving the acceptability to the qualification framework and development of capable human resource in food safety sector. However, it is a challenge for the educationists to work out the modalities for its successful implementation with an objective for its acceptability at national and international level.

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