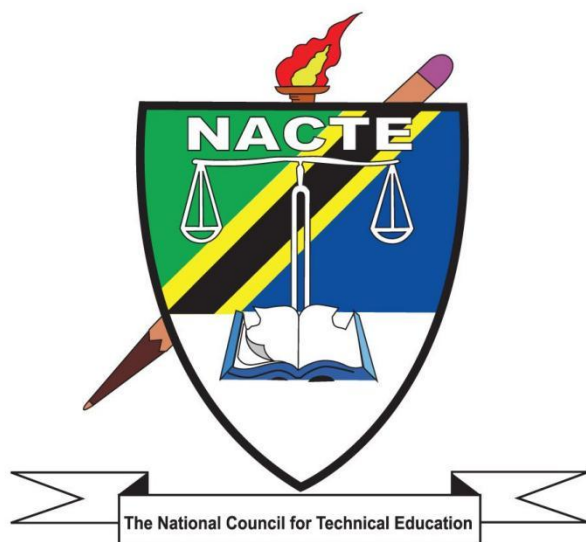


NATIONAL COUNCIL FOR TECHNICAL EDUCATION



NOVEMBER 2022

PROPOSED OCCUPATIONAL STANDARDS

FOR BIOPROCESS TECHNOLOGY

OCCUPATION: BIOPROCESS TECHNICIAN

LEVEL: NTA 6

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FOREWORD

The National Council for Technical Education (NACTE) is a corporate body established by the National Council for Technical Education Act, Cap.129. The Act provides a legal framework for the Council to coordinate the provision of technical education and training in Tanzania. The mandate of NACTE is three-fold, namely; Regulatory, Quality Assurance and Policy Advisory. In discharging its mandate, the Council has been charged with the responsibilities, among others, to:

- a) assist technical institutions in the transmission of knowledge, principles and training in the field of technical education and training for the benefit of the people of Tanzania;
- b) assist technical institutions in the overall development of the quality of education they provide and to promote and to maintain approved academic standards;
- c) establish and make awards in technical education which are consistent in standard and comparable to related awards in Tanzania and internationally; and
- d) ensure that the quality of education required for the awards is met and maintained throughout the duration of the delivery of the course.

In the course of execution of these responsibilities, the Council has been instituting various measures aiming at advancing the quality of training provided in technical institutions in respect of the changing demands of the labour market, both local and international.

To achieve the above obligation, NACTE, under the Ministry of Education, Science and Technology implemented the East Africa Skills for Transformation and Regional Integration Project (EASTRIP), a project aiming at promoting regional integration through supporting the regional corridors and sector markets, developing common standards and qualifications, and promoting mobility of students, faculty, and graduates. The project supports the Government of Tanzania to address shortage of skills in five sectors namely:

- (a) Energy;
- (b) Construction;
- (c) Information and Communication Technology (ICT);
- (d) Transportation; and
- (e) Agribusiness.

To address the skills, miss-match and shortage in the five (5) sectors in the country, the project funded, among others, a component of Development of Occupational Standards for Technical and Vocational Education and Training (TVET). In this regard, NACTE endeavoured to identify qualified and highly experienced experts in the five sectors from both the industry and training institutions to carry out the development of Occupational Standards. The exercise was carried out at Morogoro Teachers College – Morogoro from 27th August to 24th September, 2021. The output of the exercise is Occupational Standards for 14 occupations. Occupational standards for Bioprocess and Post-Harvest Engineer are among the occupational standards for 26 occupations which have been developed.

Since Occupational Standards are statements of work performance reflecting the ability to successfully complete the functions required in an occupation, as well as the application of knowledge, skills, attitudes and understanding in an occupation, it is the Council's expectations that the developed standards will form a robust base for decision making and provide explicit guidance to policy makers, curriculum developers, educators, employers and other stakeholders in matters related to manpower planning as well as execution of Technical and Vocational Education and Training undertakings.

Prof. J. W. Kondoro
Chairman

Dar es Salaam
NOVEMBER 2022

ACKNOWLEDGEMENT

The National Council for Technical Education (NACTE) is charged with the mandate to be the Quality Assurance organ of the Government in matters related to Technical and Vocational Education and Training (TVET) and production of qualified manpower for both local and international labour markets. In order to realize this obligation, NACTE endeavours to institute policies, guidelines and standards and to set the quality benchmarks for training institutions.

However, this is only possible if there is a strong base, linking the training institutions on one hand and the demands of the industry/labour market for relevant manpower on the other hand. Therefore, the Council undertook a step to develop Occupational Standards in sectors considered to be the engine to steer the country's desire to achieve an industrial economy. This exercise would not be a success without the input and support from our stakeholders. I am indebted to acknowledge some of them here.

I wish to acknowledge and appreciate the support from the Ministry of Education, Science and Technology through the East Africa Skills for Transformation and Regional Integration Project (EASTRIP) for the financial support which facilitated the preparation of this document. I wish also to appreciate Mrs Leah Lukindo and Eng. Dr. Simon Baregu for the tireless efforts and commitment in facilitating and guiding the standards development process, Ms. Eileen Tzamburakis and Ms. ChausikuYakweli Ibrahim for compiling and typesetting the final document; and the NACTE Secretariat for coordinating the whole activity.

In a very special way I wish further to extend my sincere gratitude to this team of wonderful experts who tirelessly dedicated their time and availed their invaluable intellect in the preparation of this document. I would like to recognize the colossal inputs of the following experts:

S/N	Name	Designation	Organization
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3.	Eng. Mahmoud Bashemela	Supervisor	Pyxus Agriculture Tanzania
4.	Eng. Susan A. Mbacho	Tutorial Assistant	Sokoine University of Agriculture (SUA)

In addition, NACTE hopes to further enhance the internationalization of occupational standards and promote the modernization and internationalization of industries, facilitating Tanzania's integration into the international market and exploiting its development potential. Therefore, NACTE has invited China-Africa Vocational Education Alliance and China-Africa (Chongqing) Vocational Education Alliance to participate in the development, revision and review of occupational standards documents in collaboration with Chinese vocational institutions, so as to make use of their rich experience in vocational education efforts and rely on China's advanced and complete industrial chain and its position in the international market to contribute to the development of vocational education and related industries in Tanzania.

Therefore, I would like to express my sincere gratitude to this specialized team of Chinese institutions and experts. I thank them for their hard work and dedication, and for contributing their wisdom and experience to the preparation of this document. I would like to thank the following institutions and experts for their support:

<u>S/N</u>	Institute	Name	Title/ Professional Field
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NOVEMBER 2022

ABBREVIATIONS

AP	Agricultural Produce
FIFO	First In First Out
GMP	Good Manufacturing Practices
HACCP	Hazard Analysis and Critical Control Point
KPIs	Key Performance Indicators
NACTE	National Council for Technical Education
NOS	National Occupational Standards
OS	Occupational Standards
OSHA	Occupational Safety and Health Agency
SOPs	Standard Operating Procedures
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training

GLOSSARY OF TERMS

Circumstantial knowledge:	Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues
Competence:	The ability to use knowledge, understanding, practical and thinking skills to perform effectively to the workplace standards required in employment.
Competency:	A description of the ability one possesses when able to perform a given occupational task effectively and efficiently.
Competency-based education:	An instructional program that derives its content from validated tasks and bases assessment on the learner's performance
Curriculum:	A description or composite of statements about “what is to be learned” by the trainee/student in a particular instructional programme; a product that states the “intended learning outcomes”.
Educational/training programme:	The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation.
Occupation:	A specific position requiring the performance of specific tasks – essentially the same tasks are performed by all employees having the same title. (Example: baker)
Occupational analysis:	A process used to identify the tasks that are important to employees in any given occupation
Occupational area:	This is a broad grouping of related jobs. Example: food service
Occupational Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including

knowledge and relevant attitudes. They also act as performance tool of assessment of the pre – scribed outcomes.

Performance criteria:	Indicate the expected end results or outcome in form of evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor.
Standards:	it is a set of statement, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance
Task analysis:	The process of analysing each task to determine the steps, related knowledge, attitudes, performance standards, tools and materials needed, and safety concerns required of employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, consists of two or more definite steps, and leads to a product, service, or decision.
Underpinning Knowledge:	This is crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification process:	The process of having experts review and conform the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.

Occupational Competence: The application of knowledge and skills to perform consistently to the standards required in the work context.

1.0. INTRODUCTION

Technical Education and Training (TET) is one of the most important education sub-sectors in Tanzania, responsible for developing a skilled workforce to support the country's industrialization economic agenda. Tanzania's Development Vision 2025 intends to raise the country's economy to a middle-income status. This requires a skilled workforce that is aligned with the needs of the public and private sectors of the economy. The National Council for Technical Education has begun the job of drafting Occupational Standards that will eventually be adopted as National Occupational Standards for TET in order to ensure that it meets the needs of the labour market and the country's economic agenda.

National Occupational Standards (NOS) are performance criteria that are matched with labour market demands. Each National Occupation Standard describes functions, performance standards, and knowledge/understanding for one important function or task. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruiting, supervision, and appraisal, as well as TET standards. They're also helpful for benchmarking and harmonizing qualifications on a national and international level. Standards, in general, provide a solid framework for high-quality TET that is labour market-relevant, current and consistent in delivery across all public and private institutions.

However, it must be noted that, Occupational Standards and Training standards/qualifications standards are different. Occupational standards are defined in terms of activities performed by a person in a selected occupation (e.g., an electrical engineer designs electrical wiring circuits, performs trouble shooting in electrical wiring, etc.) and they are usually defined by employers following procedures agreed upon by all stakeholders. Education and training standards are developed from the activities defined in occupational standards, and they include learning objectives to ensure that the necessary skills and knowledge are developed by a person to enable him or her to function at an agreed level in an occupation. Education and Training standards are used to define curricula in training institutions. It is however critical that there must be a direct link between the occupational standards and the training standards to respond to demands of the labour market.

In TET delivery, Tanzania adopted the Competence-based Education and Training (CBET) approach. The CBET approach focuses on providing learners with the skills and knowledge required to meet the occupational standards. Occupational standards are thus the starting point for developing Competence-based Education and Training (CBET) programs. TET institutions will be required to benchmark their curricula with relevant occupational standards.

Occupational Standards are developed based on a given occupation's current and future demands. As a result, they serve as a means of bridging the gap between the worlds of employment and technical education and training (TET).

The Bioprocess Technician Occupation has its own set of occupational standards. The document explains how the occupational standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

The Occupational standards development process began with an examination of major documents that guide Tanzanian skill development. The 10-year National Skills Development Strategy (2016-2026) was one of the documents reviewed, and it outlined six (6) economic sectors that should be prioritized when developing skills development programmes. These sectors include: Transport and logistics, Tourism and Hospitality, Agribusiness, Construction, Energy and ICT. NACTE labour market reports were also used in the literature review to determine the skills demand in the Tanzanian labour market as a whole.

After the literature review, a workshop comprised of expert workers and educators with substantial knowledge and experience in the occupation conducted an occupational analysis utilizing the DACUM approach to produce the occupational profile. The analysis resulted in DACUM Charts, which are attached as **Appendix 1** to this document.

The workshop thereafter continued with the development of occupational standards. Experts in Occupational Analysis and Occupational Standards Development facilitated the workshop. Interviews, online surveys, and a stakeholder forum were used to validate the occupational standards. Bio - processing and Post-harvest Engineers, supervisory technicians on the job, and experienced experts in Bio-processing were key informants in the survey to establish occupational trends. This information was used to gain insight from the workplaces regarding trends and changes in the profession, including how well graduates are equipped for working in the occupation. A total of online surveys were completed by experts from the labour market across the country. Apart from the survey aiding in defining the scope for the occupational analysis, they served to engage a wide cross-section of experts in the occupation. The stakeholders' forum was attended by participants from different parts of the country representing various companies.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR BIOPROCESS TECHNICIAN

The Bioprocess technician plays an important role in areas like agricultural produce collection, transport, storage and processing. Bioprocessing technicians operate equipment, measure chemicals and formulate complex products, among other tasks. Bio process Technicians are involved at all stages of a manufacturing process. The role requires individuals to follow strict internal protocols and Standard Operating Procedures (SOPs) as well as following current Good Manufacturing Practices (cGMP). The standard covers the main duties of Bioprocess technician as follows:

- a) Implement safety measures at work place
- b) Perform Quality Test of the received Agricultural Produce (AP) from Farmers /Agro Dealers
- c) Conduct preventive maintenance of processing AP machines
- d) Supervise production operations of AP
- e) Prepare packaging materials of a processed AP
- f) Conduct quality test of the finished product
- g) Design packaging of a processed AP
- h) Monitor waste produced in production line.
- i) Create business of the processed AP

The Occupational standards have been clustered into NTA qualification levels i.e. NTA levels 4, 5 and 6.

4.0. VALIDITY PERIOD

The occupational standards will be valid for 3-5 years due to the fast-changing nature of technology. The review will proceed in the same manner as the previous one, with new occupational standards being developed based on current labour market information.

5.0. OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDARDS FOR BIOPROCESS TECHNOLOGY TECHNICIAN – LEVEL 6

OCCUPATION	BIOPROCESS TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MONITOR WASTE PRODUCED IN PRODUCTION LINE	DUTY NO.	601
TASK TITLE	PERFORM WASTE COLLECTION IN PRODUCTION LINE	TASK NO.	6011
PERFORMANCE CRITERIA	The person performing this task must be able to apply knowledge and skills to perform waste collection from the production line as per approved standards and procedures.		
RANGE STATEMENT	The task will be performed in the production line under the supervision of an Engineer. The following tools, equipment and safety gear will be needed to accomplish this task: Personal Protective Equipment (masks, gloves, glasses, safety boots, coveralls), cleaning aids (brooms, dust pans, mop, squeezer, dust wipers, shovels, rakes, pitchforks), containers, loaders and bins, detergents, sanitizer and forklifts or hoists.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Prepare materials, tools and equipment for waste collection; 2. Identify waste characteristics; 3. Identify hazardous materials in waste to be collected; 4. Establish waste collection methods; 5. Establish waste collection points; 6. Separate waste based on characteristics in the production line; 7. Identify waste collection container; 8. Collect waste into appropriate collection points; 9. Collect waste containers; 10. Perform Loading and offloading of waste materials into the waste containers or trucks; 11. Transport collected waste to the appropriate place;		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1 Identify waste, defective products and semi-finished products generated during production; 1.2 Collect waste; 1.3 Transport waste; 1.4 Sample waste; 1.5 apply safety and health rules at workplace. 2.0. Principles The person must be able to explain the principles of: 2.1 Proximity; 2.2 Waste management; 2.3 Wastewater treatment. 3.0. Theories The person must be able to explain: 3.1. Types of waste collected; 3.2. Characteristics of wastes; 3.3. Types of waste containers; 3.4. Collection techniques; 3.5. Basic environmental management;	

12. Complete forms, records and documentations; 13. Clean waste removal equipment and tools; 14. Clean the area for any residue waste; 15. Store equipment and tools at appropriate place; 16. Observe safety and health rules and regulations at work place.	3.6. Waste analysis; 3.7. Waste handling. 4.0. Essential skills 4.1. Time management; 4.2. Self-motivation; 4.3. Commitment; 4.4. Teamwork skills; 4.5. Integrity; 4.6. Customer service skills; 4.7. Readiness to implement knowledge; 4.8. Communication skills.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Waste collection in the production line is performed as per approved standards and guidelines.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. NEMC Regulations; 2. Environmental Management Act; 3. Environmental Impact Assessment Regulation and guidelines; 4. National Solid Waste Management Strategy (NSWMS) ; 5. Extent of Responsibility; 6. Occupational Safety and health; 7. Safe handling of equipment and tools; 8. Guidelines for Framework Legislation for Integrated Waste Management.

OCCUPATION	BIOPROCESS TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MONITOR WASTE PRODUCED IN PRODUCTION LINE	DUTY NO.	601
TASK TITLE	PERFORM WASTE TREATMENT FROM PRODUCTION LINE	TASK NO.	6012
PERFORMANCE CRITERIA	The person performing this task must be able to apply knowledge and skills to perform waste treatment from production line as per approved standards and guidelines		
RANGE STATEMENT	The task will be performed in the waste treatment plant under supervision of an Engineer. The following equipment, tools and materials will be needed in performing the task: Personal protective equipment (masks, gloves, safety boots, coveralls), Cleaning aids (brooms, scrapers), loaders, agitators, stirrers and mixers, aerators, separators, dehydrators and renderers (e.g., boiler), Laboratory supplies (treatment reagents), detergents and monitoring devices.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Prepare materials, tools and equipment for waste treatment; 2. Take samples of waste to be treated; 3. Conduct laboratory tests; 4. Identify hazardous materials in the waste to be treated; 5. Edit hazardous waste results; 6. Treat hazardous waste according to the standards and procedures; 7. Sample and test treated waste; 8. Compare test results with the standards; 9. Comply with prescribed safety procedures and standards; 10. Store tools and equipment as per standards and procedures; 11. Clean and maintain plant and equipment; 12. Keep records and other documentation; 13. Observe safety and health rules and regulations.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Treat waste of different types; 1.2 Sample waste for laboratory test; 1.3 Carry out laboratory procedures, and judge the types of waste; 1.4 Operate special equipment as required; 1.5 Maintain special equipment. 2.0. Principle The person must be able to explain the principles of: 2.1 Waste management; 2.2 Wastewater treatment; 2.3 Classification of hazardous and recyclable goods in waste. 3.0. Theories The person must be able to explain: 3.1 Waste treatment techniques; 3.2 Waste treatment processes; 3.3 Waste management; 3.4 Operate equipment in the plant; 3.5 Waste sorting techniques; 3.6 Waste types and characteristics; 3.7 Waste contaminants;	

	3.8 Biochemistry knowledge; 3.9 Basic environmental management. 4.0. Essential skills 4.1 Interpersonal skills; 4.2 Teamwork skills; 4.3 Communication skills; 4.4 Problem solving skills; 4.5 Computer skills; 4.6 Waste processing technical skills; 4.7 Self-management skills; 4.8 Integrity; 4.9 Time management; 4.10 Commitment; 4.11 Analytical skills.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Waste treatment is performed as per approved regulations and standards.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. NEMC Regulations; 2. Environmental Management Act; 3. Environmental Impact Assessment Regulation and guidelines; 4. National Solid Waste Management Strategy (NSWMS) ; 5. Extent of Responsibility; 6. Occupational Safety and health Authority (OSHA) ; 7. Safe handling of equipment and tools; 8. Guidelines for Framework Legislation for Integrated Waste Management; 9. Wastewater treatment regulations; 10. Environmental rules and regulations.

OCCUPATION	BIOPROCESS TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MONITOR WASTE PRODUCED IN PRODUCTION LINE	DUTY NO.	601
TASK TITLE	PERFORM WASTE DISPOSAL FROM PRODUCTION LINE	TASK NO.	6013
PERFORMANCE CRITERIA	The person performing this task must be able to apply knowledge and skills to perform waste disposal from production line as per approved standards and procedures.		
RANGE STATEMENT	The task will be performed at the disposal site under the supervision of an Engineer. The following equipment, tools and materials will be needed in performing the task: Personal protective elements (masks, gloves, safety boots, coveralls), Cleaning aids (brooms, scrapers), cutters, shredders, crushers and grinders, incinerators, renderer (e.g., boiler), balers, compactors, vacuum, scrapers or high-pressure sprayer, detergents, solvents, sandblasters, filter pumps and/or steam cleaner.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Prepare site for disposing waste; 2. Identify general waste to be disposed; 3. Establish general waste disposal methods; 4. Separate general waste based on the disposal method; 5. Remove any waste from the equipment surface; 6. Remove or limit contamination following emergencies involving hazardous substances; 7. Operate machines or equipment for disposing waste materials, and adjust their operating parameters; 8. Comply with standard operating procedures; 9. Clean contaminated equipment, tools, machine or areas for reuse; 10. Store tools and equipment appropriately; 11. Complete forms, records and documents;		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1.Classify waste generated during production; 1.2.Dispose waste of different types; 1.3.Operate machines and equipment as required; 1.4.Maintain special equipment. 2.0. Principles The person must be able to explain the principles of: 2.1. Waste management; 2.2. Wastewater treatment; 2.3. Environmental protection. 3.0. Theories The person must be able to explain: 3.1. Waste disposal methods; 3.2. Types of waste disposal; 3.3. Solid-waste management; 3.4. Hazardous-waste management; 3.5. Waste management; 3.6. Waste site management; 3.7. Waste minimization hierarchy; 3.8. Basic environmental management. 4.0. Essential skills	

12. Comply with health and safety rules and regulations.	4.1. Interpersonal skills; 4.2. Teamwork skills; 4.3. Communication skills; 4.4. Waste processing technical skills; 4.5. Self-management skills; 4.6. Integrity; 4.7. Commitment; 4.8. Time management; 4.9. Self-awareness.
DESCRIPTION OF THE END PRODUCTS/SERVICE	Waste disposal is performed as per approved standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. NEMC Regulations; 2. Environmental Management Act; 3. Environmental Impact Assessment Regulation and Guidelines; 4. National Solid Waste Management Strategy (NSWMS) ; 5. Extent of Responsibility; 6. Occupational Safety and health; 7. Safe handling of machine, equipment and tools; 8. Guidelines for Framework Legislation for Integrated Waste Management; 9. Rules and regulations for waste disposal.

OCCUPATION	BIOPROCESS TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MONITOR PROCESSING MACHINE	DUTY NO.	602
TASK TITLE	MAINTAIN CLEANLINESS OF PROCESSING MACHINE AND WORKPLACE	TASK NO.	6021
PERFORMANCE CRITERIA	The person performing this task must be able to apply knowledge and skills to maintain cleanliness of processing machines and workplace as per standards and procedures.		
RANGE STATEMENT	The task will be performed at the factory under the supervision of a technician. The following equipment, tools and materials will be needed in performing the task: personal protective elements (masks, gloves, safety boots, coveralls), cleaning aids (brooms, scrapers), detergents, solvents, sandblasters, filter pumps and/or steam cleaner, operating manual.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Prepare materials, tools and equipment for cleaning; 2. Study machine’s operating manual; 3. Shut down the machine; 4. Observe principles of cleaning processing machine; 5. Clean machine as per its operation principles; 6. Oversee assembly and disassembly procedures of machine parts; 7. Clean the machine parts; 8. Clean the machine’s cutting tools 9. Maintain machine condition; 10. Sterilize machine parts; 11. Clean workplace; 12. Complete forms, records and other documentation; 13. Clean contaminated equipment, tools, machine or areas for reuse; 14. Store tools and equipment appropriately; 15. Comply with health and safety rules and regulations.		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1.Clean; 1.2.Sterilize; 1.3.Disinfect; 1.4.Use operating manual; 1.5.Analyze machine structure drawings; 1.6.Check health and safety at the workplace. 2.0. Principles The person must be able to explain the principles of: 2.1.Assembly and disassembly machine parts; 2.2.Cleaning; 2.3.Floor care; 2.4.Machine Care; 2.5.Using cleaning machines; 2.6.Operating machine. 3.0. Theories The person must be able to explain: 3.1. Hygiene theory; 3.2. Categories of cleaning agents; 3.3. Theory of cleanliness; 3.4. Types of chemical sanitizers; 3.5. Types of cleaning methods; 3.6. Engineering drawing.	

	4.0. Essential skills 4.1. Interpersonal skills; 4.2. Teamwork skills; 4.3. Communication skills; 4.4. Self-management skills; 4.5. Integrity; 4.6. Efficiency in using hand tools; 4.7. Attention to details; 4.8. Time management; 4.9. Aware of quality; 4.10. Reliable; 4.11. Problem solving skills; 4.12. Curiosity.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Cleanliness of the processing machine and work place is maintained as per approved standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Extent of Responsibility; 2. Occupational Safety and health; 3. Safe handling of equipment and tools; 4. Environmental rules and regulations.

OCCUPATION	BIOPROCESS TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MONITOR PROCESSING MACHINE	DUTY NO.	602
TASK TITLE	OPERATE AP PROCESSING MACHINE	TASK NO.	6022
PERFORMANCE CRITERIA	The person performing this task must be able to apply knowledge and skills to operate AP processing machines as per approved standards and procedures.		
RANGE STATEMENT	The task will be performed at the factory under the supervision of an engineer. The following equipment, tools and materials will be needed in performing the task: personal protective equipment (masks, gloves, safety boots, coveralls), machine manuals, material handling equipment, engineering toolbox (screw driver, set plies etc), production monitoring equipment, weigh balance, tape measure and computer.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Prepare materials, tools and equipment required to perform the task; 2. Mount the working tools; 3. Set up the machine; 4. Prepare the materials to be processed; 5. Observe working capacity of the machine; 6. Observe functional safety; 7. Observe machine’s operating manual/procedures; 8. Follow production guidelines and specifications of operating machines; 9. Feed the materials; 10. Operate machine tools; 11. Monitor the tools and equipment of the machine; 12. Check the quantities and quality of the product; 13. Quantify the finished product; 14. Determine output efficiency of each unit regularly; 15. Fix/troubleshoot machine malfunctioning; 16. Establish improvements needed for the processing machine;		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Feed materials; 1.2. Operate an AP processing machine; 1.3. Troubleshoot machines; 1.4. Assemble and disassemble machine parts; 1.5. Analyze machine structure and operating principles. 2.0. Principles The person must be able to explain the principles of: 2.1. Machine guarding; 2.2. Machining; 2.3. Work safety. 3.0. Theories The person must be able to explain: 3.1. Machine operations; 3.2. Types of machining tools; 3.3. Mechanics knowledge; 3.4. Maintenance; 3.5. Materials sciences; 3.6. Properties of biological materials. 4.0. Essential skills 4.1. Attention to details; 4.2. Problem solving skills; 4.3. Computer skills;	

17. Perform periodic checks on processing machine; 18. Perform finishing operations; 19. Switch the machine on and off based on procedures; 20. Oversee training of the new or junior machine operators; 21. Complete forms, records and other documentation; 22. Store tools and equipment appropriately; 23. Comply with health and safety rules and regulations.	4.4. Proficiency with hand tools; 4.5. Willingness; 4.6. Teamwork; 4.7. Communication skills; 4.8. Time management; 4.9. Creativity skills; 4.10. Integrity; 4.11. Honest; 4.12. Self-awareness; 4.13. Reliable; 4.14. Responsible; 4.15. Innovative; 4.16. Accurate; 4.17. Analytical skills; 4.18. Patient; 4.19. Measurement and Unit; 4.20. Leadership and training skills.
DESCRIPTION OF THE END PRODUCTS / SERVICE	AP machine is operated as per approved standards guidelines and procedures.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Machine Safety legislation and standards; 2. Extent of Responsibility; 3. Occupational Safety and health; 4. Safe handling of equipment and tools.

OCCUPATION	BIOPROCESS TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MONITOR PROCESSING MACHINE	DUTY NO.	602
TASK TITLE	PERFORM PREVENTIVE MAINTENANCE OF AP PROCESSING MACHINE	TASK NO.	6023
PERFORMANCE CRITERIA	The person performing this task must be able to apply knowledge and skills to perform preventive maintenance of the AP processing machine as per standards and procedures.		
RANGE STATEMENT	The task will be performed at the factory under the supervision of an Engineer. The following equipment, tools and materials will be needed in performing the task: Personal protective elements (masks, gloves, safety boots, coveralls), machine manuals, material handling equipment, Engineering toolbox (Screw driver, set plies etc), production monitoring equipment, Tape measure, turning machine, milling machine, drilling machine, Vernier calliper, machine attachment, micrometre, tool grinding machine, cutting tools for milling, twist drill, knurling, reamer, block gauge, angle gauge, dial indicator, hand tools (file, hacksaw, hammer, wrench, spanner, Allen key, screwdriver), jigs and fixtures, machine vice, operating manuals.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Obtain manufacturer’s operating manual/instructions; 2. Prepare materials, tools and equipment to perform the task; 3. Verify availability of replaceable parts at the factory; 4. Calibrate measuring instruments of the machine (e.g., Pressure gauge, temperature gauge) ; 5. Verify safe functioning of the machine; 6. Maintain proper fluid levels; 7. Change machine oil/ coolant; 8. Check all the machine operations panels; 9. Replace worn-out parts; 10. Maintain process controller; 11. Perform functional tests; 12. Report any unusual scenario of a machine; 13. Perform regular maintenance of equipment;		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Operate special equipment for AP processing; 1.2. Carry out maintenance of special equipment for AP processing; 1.3. Carry out the overhaul of special equipment for AP processing; 1.4. Calibrate measuring instrument; 1.5. Use operating manuals on special equipment; 1.6. Interpret drawings of special equipment. 2.0. Principles The person must be able to explain the principles of: 2.1. Overhaul; 2.2. Machining; 2.3. Machine guard; 2.4. Work safety. 3.0. Theories The person must be able to explain: 3.1. Advanced knowledge of following blueprints and manuals;	

14. Complete forms, records and other documentation; 15. Store tools and equipment appropriately; 16. Comply with health and safety rules and regulations.	3.2. Computer-controlled machine tools (CNC Machine) ; 3.3. Basic mechanics knowledge; 3.4. Engineering drawing. 4.0. Essential skills 4.1. Communication skills; 4.2. Computer skills; 4.3. Time management; 4.4. Key attention to detail to identify maintenance, product or operations issues; 4.5. Ability to stand, sit or be in other physical demanding positions for long periods of time; 4.6. Reading skills; 4.7. Proficiency with hand tools; 4.8. Teamwork; 4.9. Willing to share ideas and information; 4.10. Integrity; 4.11. Mechanical skills.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Preventive Maintenance of AP processing machine is performed as per approved standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Machine Safety legislation and standards; 2. Extent of Responsibility; 3. Occupational Safety and health; 4. Environmental rules and regulations; 5. Safe handling of equipment and tools.

OCCUPATION	BIOPROCESS TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CREATE BUSINESS OF THE PROCESSED AGRICULTURAL PRODUCE (AP)	DUTY NO.	603
TASK TITLE	PREPARE MARKETING STRATEGY AND PLAN OF THE PROCESSED AP	TASK NO.	6031
PERFORMANCE CRITERIA	The person performing this task must be able to apply knowledge and skills to prepare marketing strategy of the processed AP as per standards and procedures.		
RANGE STATEMENT	The task will be performed in office under the supervision of Technician. The following equipment, tools and materials will be needed in performing the task: computer, statistical software package, stationery, masks, questionnaires, tablet/smart phones, recorder, internet.		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Prepare tools, equipment and safety gear to perform the tasks; 2. Identify market trends; 3. Conduct market analysis; 4. Identify loyal customers; 5. Redefine the objectives; 6. Outline the marketing techniques; 7. Obtain the marketing budget; 8. Identify market problem to be addressed; 9. Carryout a desk review; 10. Identify market gap/opportunity; 11. Establish market research plan; 12. Obtain research tools (e.g., questionnaire) ; 13. Determine research sample size; 14. Collect data; 15. Analyze data; 16. Produce a market research report;		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Carry out market research; 1.2. Analyze data; 1.3. Write a research report; 1.4. Effectively present research findings; 1.5. Select representative research sample; 1.6. Describe a product; 1.7. Carry out cost-benefit analysis; 1.8. Develop business plan. 2.0. Principles The person must be able to explain the principles of: 2.1. Market research/intelligence; 2.2. Data analysis; 2.3. Management; 2.4. Sales and market; 2.5. Finance; 2.6. Production cost. 3.0. Theories The person must be able to explain: 3.1. Research methodology;	

17. Disseminate the market research findings; 18. Complete forms, records and other documentation; 19. Observe safety and health rules and regulations.	3.2. Market analysis; 3.3. Customer's behaviour; 3.4. Business strategies; 3.5. Entrepreneurship; 3.6. Competitive analysis; 3.7. Financial analysis; 3.8. Loan management. 4.0. Essential skills 4.1. Teamwork skills; 4.2. Communication skills; 4.3. Customer care; 4.4. Work interpersonal skills; 4.5. Self-awareness; 4.6. Self-discipline; 4.7. Critical thinking; 4.8. Integrity; 4.9. Problem solving; 4.10. Time management; 4.11. Commitment; 4.12. Entrepreneurship skills.
DESCRIPTION OF THE END PRODUCTS/ SERVICE	Marketing strategy and plan of the processed AP is prepared as per given standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safe handling of equipment and tools; 2. Extent of responsibility; 3. Occupational safety and health; 4. Observing good codes of conducts; 5. Observing research ethics; 6. Considering cultural diversity and respect other's culture; 7. Understanding and applying laws, regulations and policy governing the Agribusiness sector; 8. Financial rules and regulations (BOT).

OCCUPATION	BIOPROCESS TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CREATE BUSINESS OF THE PROCESSED AGRICULTURAL PRODUCE (AP)	DUTY NO.	603
TASK TITLE	PRODUCE PROTOTYPE OF THE PROCESSED AP	TASK NO.	6032
PERFORMANCE CRITERIA	The person performing this task must be able to apply knowledge and skills to produce a prototype of the processed AP as per standards and procedures.		
RANGE STATEMENT	The task will be performed at premises under the supervision of an Engineer. The following equipment, tools and materials will be needed in performing the task: PPEs, packaging materials, stationery, processing machine		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Establish customer’s need; 2. Identify characteristics of AP to be produced; 3. Prepare materials, tools and equipment for processing AP; 4. Manufacture the products based on customer’s desire/demand; 5. Test the quality of the produced prototype; 6. Keep record of the quality of produced prototype; 7. Clean working area, tools and equipment; 8. Complete forms, records and others documentation for health & safety measure; 9. Observe safety and health rules and regulations; 10. Store tools, equipment and safety gear.		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Design different AP products; 1.2. Create an AP product prototype; 1.3. Test sample quality; 1.4. Provide a test report; 1.5. Coordinate sample improvement. 2.0. Principles The person must be able to explain the principles of: 2.1. Product design; 2.2. Operating equipment; 2.3. Work safety. 3.0. Theories The person must be able to explain: 3.1.Properties of materials; 3.2.Manufacturers/suppliers instructions; 3.3.AP processing factory machines layout; 3.4.AP wastes management. 4.0. Essential skills 4.1. Teamwork skills; 4.2. Communication skills; 4.3. Entrepreneurship skills;	

	4.4. Budgeting skills; 4.5. Self-awareness; 4.6. Self-discipline; 4.7. Critical thinking; 4.8. Integrity; 4.9. Problem solving; 4.10. Time management; 4.11. Commitment.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Prototype of the processed AP is produced as per approved standard and procedures.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. HACCP rules and regulation; 2. Extent of responsibility; 3. Health and safety legislations and regulations (OSHA) ; 4. Safely handling of measuring instruments; 5. Maintaining the normal work flow; 6. Making the work area safe and secure; 7. Safely handling of working tools.

OCCUPATION	BIOPROCESS TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CREATE BUSINESS OF THE PROCESSED AP	DUTY NO.	603
TASK TITLE	MARKET PROTOTYPE OF PROCESSED AP	TASK NO.	6033
PERFORMANCE CRITERIA	The person performing this task must be able to apply knowledge and skills to market prototype of processed AP as per standards and procedures.		
RANGE STATEMENT	The task will be performed at premises under the supervision of Technician. The following equipment, tools and materials will be needed in performing the task: computer, printers, calculator, stationery, social media accounts, mass media, flyers, tablet, smartphone, business card, website, logo, questionnaire		
EVIDENCE REQUIREMENTS			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Create a mission statement for a processed AP; 2. Identify market segments/audience to market your processed AP; 3. Identify value proposition of processed AP; 4. Obtain business brand label of processed AP; 5. Identify your competitors; 6. Observe SMART marketing goals; 7. Prepare marketing and promotional strategies of processed AP; 8. Obtain budget for marketing of processed AP; 9. Advertise processed AP at different platforms; 10. Observe daily records of market respond of the processed AP; 11. Analyze acceptability of the prototype, and provide appropriate suggestions on adjustment;		Detailed knowledge about: 1.0. Methods The person performing this task must be able to explain how to: 1.1. Promote a product; 1.2. Brand a product; 1.3. Advertise; 1.4. Analyze industry information; 1.5. Provide product quotation and estimation; 1.6. Act as a merchandiser; 1.7. Carry out product market data survey. Principles The person must be able to explain the principles of: 2.1. Marketing strategies; 2.2. Product branding. Theories The person must be able to explain: 3.1. E-marketing/e-commerce; 3.2. Product marketing; 3.3. Entrepreneurship; 3.4. Mass media; 3.5. Social media; 3.6. Business branding. Essential skills	

12. Document the market status of processed AP; 13. Complete forms, records and others documentation for marketing; 14. Observe safety and health rules and regulations.	4.1. Teamwork skills; 4.2. Communication skills; 4.3. Entrepreneurship skills; 4.4. Budgeting skills; 4.5. Self-awareness; 4.6. Self-discipline; 4.7. Critical thinking; 4.8. Integrity; 4.9. Problem solving; 4.10. Time management; 4.11. Commitment.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Prototype of processed AP is marketed as per standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safe handling of equipment and tools; 2. Financial rules and regulation; 3. Extent of responsibility; 4. Occupational safety and health.

TABLE 1: DACUM CHARTS FOR BIOPROCESS TECHNICIAN – LEVEL 6

DUTIES	TASKS	ENABLERS
1.0. Monitor waste produced in production line	1.1. Perform waste collection in production line. 1.2. Perform waste treatment from production line. 1.3. Perform waste disposal from production line.	General Skills and knowledge • Basic waste treatment skills • Communication skills • Knowledge on properties of waste generated during AP production • Basic environmental protection skills • Basic personal protection skills Tools and Equipment • PPEs (masks, gloves, glasses, safety boots, coveralls etc.) • Cleaning aids (brooms, mopper, squeezer, dust wipers etc.) • Waste bins, brooms, spade, etc. Materials • Laboratory supplies (reagents for treatment) • Detergents Worker behaviours • Team work • Commitment • Time management • Self-motivation • Awareness of work safety • Awareness of environmental protection
2.0 Monitor processing machines	2.1 Maintain cleanliness of processing machine and workplace. 2.2 Operate AP processing machine. 2.3 Perform preventive maintenance of AP processing machine.	General Skills and Knowledge • Operation, maintenance and overhaul skills for special waste treatment equipment • Communication skills • Basic environmental protection skills • Basic personal protection skills Tools and Equipment • PPEs (masks, gloves, safety boots, coveralls), cleaning aids (brooms, scrapers), sandblasters, filter pumps and/or steam cleaners, material handling equipment, engineering toolbox (screwdriver, set plies, etc.), production monitoring equipment, weigh balance, tape measure, turning machine, milling machine, drilling machine, vernier

		calliper, machine attachment, micrometre, tool grinding machine, cutting tools for milling, twist drill, knurling, reamer, block gauge, angle gauge, dial indicator, hand tools (file, hacksaw, hammer, wrench, spanner, Allen key, screwdriver), jigs and fixtures, machine vice, operating manuals, computers Materials • Detergents • Chemical reagents Worker behaviours • Teamwork • Commitment • Time management • Self-motivation • Rigorous and scientific attitude • Awareness of safety protection • Awareness of environmental protection
3.0 Create business of the processed AP	3.1 Prepare marketing strategy and plan of the processed AP. 3.2 Produce prototype of processed AP. 3.3 Market prototype of processed AP.	General Skills and Knowledge • Communication skills • Domestic and foreign trade marketing skills • Advertisement production and promotion skills • Industry information collection and market data analysis skills • Basic computer and network operation skills • Acquaintance with AP characteristic, knowledge in production process, judgment on product quality • Tracking, inspection and supervision skills required during AP production • Operation of AP processing machinery • GMP management of AP Tools and Equipment • Computer, statistical software package, stationery, masks, tablet/smart phones, recorder, Internet, PPE, packaging

		materials, processing machines, printers, social media accounts, mass media, flyers, business cards, website, logo, questionnaire Materials • Raw materials of AP • Detergents Worker behaviours • Integrity • Good communication and coordination skills • Teamwork • Time management • Considerate and active services
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