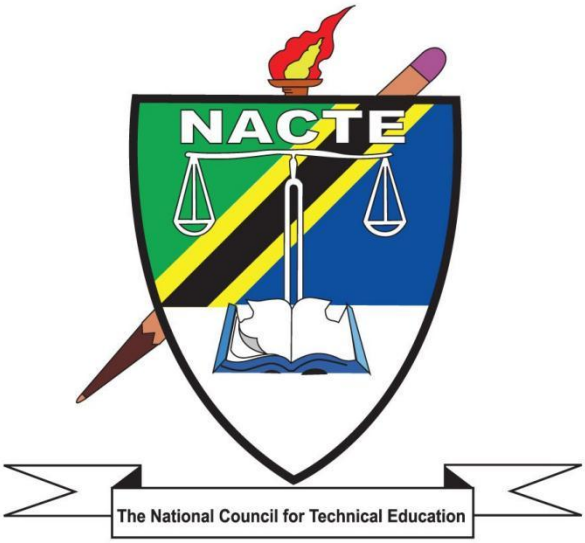
NATIONAL COUNCIL FOR TECHNICAL EDUCATION



NOVEMBER2022

PROPOSED OCCUPATIONAL STANDARDS

FOR BIOPROCESS TECHNOLOGY

OCCUPATION: BIOPROCESS TECHNICIAN

LEVEL: NTA 5

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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
1.	Eng. Kimweri G. Baguma	Head Miller	CPB
2.	Eng. Sharif Mwangi	Head of Unit Leather Processing (TA)	Dar es Institute of Technology (DIT) - Mwanza

S/N	Name	Designation	Organization
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:

S/N	Institute	Name	Title/Professional Field
1	Ningbo Polytechnic	Tang Xiao	Associate Professor/Development & Utilization of Active Plant Ingredients
2		Shen Fangdi	Experimenter/Molecular Biology

3		Peng Zhenbo	Professor/New Energy Materials

Dr. A. B. Rutayuga
Executive Secretary

Dar es Salaam
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 5

OCCUPATION	BIOPROCESS TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MONITOR PRODUCTION OPERATIONS OF AP	**DUTY NO.**	501
TASK TITLE	CONTROL PRODUCTION PROCESS OF AP	**TASK NO.**	5011
PERFORMANCE CRITERIA	The person performing this task must be able to apply knowledge and skills to control production process of AP as per given standards and procedures.		
RANGE STATEMENT	The task will be performed in the factory under supervision of an Engineer. The following equipment, tools and materials will be needed in performing the task: mechanical gloves, mask, hair nets, reflectors, weigh balance, timer, helmet, safety boot, industrial coat, overcoat, agricultural produce, stationery, printer, forms, logs, operating manuals.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Obtain the materials, tools, safety gear and equipment needed to perform task; 2. Establish team to perform the task; 3. Determine the weight of the AP to be processed; 4. Record exact time each process starts; 5. Record downtime for each processing machine in production line; 6. Monitor operating conditions for processing; 7. Weigh by-products obtained; 8. Weigh waste produced; 9. Weigh processed AP; 10. Conduct process according to SOPs and keep work records; 11. Check progress of the process; 12. Record time taken to accomplish the production; 13. Observe safety and health rules and regulations when performing the task;	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 Operate the processing machine; 1.2 Use operating manuals; 1.3 Use equipment; 1.4 Simply maintain equipment. **2.0. Principles** The person must be able to explain the principles of: 2.1. GMP's; 2.2. HACCP; 2.3. SOPs; 2.4. 5S site management. **3.0. Theories** The person must be able to explain: 3.1. Classification of production system; 3.2. Processing of Agricultural produce; 3.3. Quality assurance; 3.4. Quality Control; 3.5. AP safety; 3.6. Properties of Agricultural produce; 3.7. Operation of different processing machines; 3.8. Techniques for productivity improvement; 3.9. Basic electrical engineering;

14. Observe Good manufacturing practices while performing the task; 15. Observe HACCP practices on a particular processed AP while performing task; 16. Clean the working tools and equipment; 17. Store tools, equipment and safety gear appropriately; 18. Keep the factory clean and organized; 19. Complete forms, records and other documentation; 20. Properly place by-products, waste and processed AP.	3.10. The proper treatment of waste; 3.11. Safe operation and accident prevention; 3.12. Self safety protection and rescue awareness. **4.0. Essential skills** 4.1. Team work skills; 4.2. Communication skills; 4.3. Integrity and responsibility; 4.4. Computer skills; 4.5. Measurement and units conversion skills; 4.6. Readiness to implement knowledge; 4.7. Time management skills; 4.8. Safety production awareness.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Production process of AP is controlled as per approved standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safe handling of equipment and tools; 2. Extent of responsibility; 3. Good manufacturing practice; 4. Occupational safety and health; 5. ISO standards; 6. National standards.

OCCUPATION	BIOPROCESS TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MONITOR PRODUCTION OPERATIONS OF AP	**DUTY NO.**	501
TASK TITLE	CONTROL PERFORMANCE OF AP PROCESSING MACHINE.	**TASK NO.**	5012
PERFORMANCE CRITERIA	The person performing this task must be able to apply knowledge and skills to control performance of AP processing machine as per given standards and procedures.		
RANGE STATEMENT	The task will be performed in the factory under the supervision of an Engineer. The following equipment, tools and materials will be needed in performing the task: mask, hair nets, reflectors, timer, helmet, safety boot, industrial coat, overcoat, manufacturer's manuals, mechanical gloves, stationery, logs, forms.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select right tools, safety gear, materials and equipment for the task; 2. Obtain detailed information about AP to be processed; 3. Observe standard operating procedures; 4. Observe machine operating manuals; 5. Inspect AP processing machine; 6. Feed AP into processing machine; 7. Start AP processing machine; 8. Record starting time; 9. Record quantity of processed product; 10. Check the quality of the processed product; 11. Observe waste produced; 12. Weigh waste produced; 13. Record downtime of processing machine; 14. Record stopping time; 15. Determine Machine productivity Index/Measure;	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Calculate overall machine effectiveness; 1.2. Calculate machine efficiency; 1.3. Calculate the addition of raw materials and auxiliary materials according to the production volume; 1.4. Operate the processing machine; 1.5. Determine machine productivity Index; 1.6. Control AP processing Index according to product requirement; 1.7. Adjust processing technology according to AP characteristics; 1.8. Carry out routine maintenance of the equipment. **2.0. Principles** The person must be able to explain the principles of: 2.1. Integration of Overall machine Effectiveness (OEE) and reliability; 2.2. GMPs; 2.3. HACCP; 2.4. 5S site management. **3.0. Theories**

16. Deliver performance reports; 17. Complete forms, records and other documentations; 18. Clean working tools and equipment; 19. Store tools, equipment and safety gear appropriately; 20. Observe health and safety when performing the task; 21. Classify and clean raw materials according to processing requirements; 22. Conduct process according to SOPs and keep work records.	The person must be able to explain: 3.1. Operation of different processing machines; 3.2. Techniques for productivity improvement; 3.3. Classification of production system; 3.4. Efficiency of operating machines; 3.5. Basic mechanics; 3.6. Material sciences; 3.7. Basic electrical engineering; 3.8. Properties of Agricultural Produce; 3.9. Quality requirement of Agricultural Produce; 3.10. Environment protection; 3.11. Safe operation and accident prevention; 3.12. Self safety protection and rescue awareness. **4.0. Essential skills** 4.1. Teamwork skills; 4.2. Communication skills; 4.3. Integrity and responsibility; 4.4. Computer skills; 4.5. Measurement and units conversion skills; 4.6. Good data gathering skills; 4.7. Readiness to implement knowledge; 4.8. Time management skills; 4.9. Problem solving skills; 4.10. Commitment; 4.11. Safe production awareness; 4.12. Cost saving awareness.
DESCRIPTION OF THE END PRODUCTS	Performance of AP processing machine is controlled as per given standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational safety and health; 2. Safe handling of equipment and tools; 3. Extent of responsibility.

OCCUPATION	BIOPROCESS TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MONITOR PRODUCTION OPERATIONS OF AP	**DUTY NO.**	501
TASK TITLE	MAINTAIN QUALITY OF IN COMING, IN PROCESS AND FINISHED PRODUCTS	**TASK NO.**	5013
PERFORMANCE CRITERIA	The person performing this task must be able to apply knowledge and skills to maintain quality of incoming, in process and finished products as per given standards and procedures.		
RANGE STATEMENT	The task will be performed in the factory under supervision of an Engineer. The following equipment, tools and materials will be needed in performing the task: mask, hair nets, reflectors, timer, helmet, safety boot, industrial coat, overcoat, stationery, probes, weigh balance, computer, thermometer, pressure meter, tape measure.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Prepare materials, tools, safety gear and equipment to perform task; 2. Conduct regular inspection of AP to be processed; 3. Take sample at each stage in production line; 4. Conduct quality test of obtained sample (appearance inspection, sensory examination) ; 5. Identify critical control points; 6. Apply critical limits; 7. Record test results; 8. Complete forms, records and other documentations; 9. Clean working area; 10. Clean working tools and equipment; 11. Store tools, equipment and safety gear appropriately; 12. Observe health and safety when performing the task; 13. Analyze and solve AP quality problems; 14. Conduct test process according to SOPs and keep work records.	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Use handling and processing machine; 1.2. Take sample; 1.3. Conduct lab test; 1.4. Analyse quality inspection data; 1.5. Control quality. **2.0. Principles** The person must be able to explain the principles of: 2.1. HACCP; 2.2. Sampling; 2.3. SOPs; 2.4. Operating machines; 2.5. Quality standard documents. **3.0. Theories** The person must be able to explain: 3.1. Food security; 3.2. Quality assurance (QA) ; 3.3. Quality control (QC) ; 3.4. Sampling techniques; 3.5. Food control systems; 3.6. Food hygiene and safety. **4.0. Essential skills**

	4.1. Teamwork skills; 4.2. Commitment; 4.3. Communication; 4.4. Integrity and responsibility; 4.5. Trustworthy; 4.6. Computer skills; 4.7. Measurement and units conversion skills; 4.8. Good data gathering skills; 4.9. Readiness to implement knowledge; 4.10. Time management skills; 4.11. Problem solving skills; 4.12. Environment protection awareness.
DESCRIPTION OF THE END PRODUCTS	Quality of incoming, in process and finished products is maintained as per given standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational safety and health; 2. National standards (TBS) ; 3. ISO standards; 4. W.H.O guidelines; 5. Safe handling of equipment and tools; 6. HACCP guidelines and procedures; 7. Environmental rules and regulations.

OCCUPATION	BIOPROCESS TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CONDUCT PACKAGING OF PROCESSED PRODUCT	**DUTY NO.**	502
TASK TITLE	PREPARE PACKAGING MATERIALS OF PROCESSED PRODUCT	**TASK NO.**	5021
PERFORMANCE CRITERIA	The person carrying out this task must be able to apply knowledge and skills to prepare packaging materials of processed product as per standards and procedures.		
RANGE STATEMENT	The task will be performed during packaging of the finished product under minimum supervision of an Engineer. The following equipment, tools and materials will be needed in performing the task: weigh balance, computer, stationery, ppes, tape measure, leak detectors and package testing machine.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Identify the materials, tools, safety gear and equipment. needed for performing the task; 2. Establish characteristics of the product to be packed; 3. Determine proper packaging materials suitable to the product; 4. Observe quality of packaging materials; 5. Obtain labelling information of the product; 6. Determine the number of packages required; 7. Take packaging materials to the packaging points; 8. Complete forms, records and other documentation; 9. Observe safety and health when performing the task; 10. Clean tools, equipment and working environment; 11. Store tools, equipment and safety gear after completing the task; 12. Conduct test process according to SOPs and keep work records.	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Identify characteristics of processed product; 1.2. Handle packaging materials; 1.3. Obtain weight; 1.4. Select packaging materials; 1.5. Carry out quality test for packaging materials. **2.0. Principles** The person must be able to explain the principles of: 2.1. GMPs; 2.2. HACCP; 2.3. SOPs; 2.4. 5S site management. **3.0. Theories** The person must be able to explain: 3.1. Unit and measurements; 3.2. Shelf life of processed products; 3.3. Quality Control (QC) ; 3.4. Quality Assurance (QA); 3.5. Properties of packaging materials; 3.6. Interaction between food and packaging materials. **4.0. Essential skills** 4.1. Teamwork skills; 4.2. Computer skills; 4.3.Curiosity; 4.4.Communication;

	4.5.Integrity and responsibility; 4.6.Basic mathematics; 4.7.Measurements and Units conversion skills; 4.8.Time management skills; 4.9.Environment protection awareness; 4.10.Cost saving awareness.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Packaging materials of processed product is prepared as per approved standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safe handling of equipment and tools; 2. ISO standard; 3. National standard; 4. Extent of responsibility; 5. Occupational safety and health.

OCCUPATION	BIOPROCESS TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CONDUCT PACKAGING OF PROCESSED PRODUCT	**DUTY NO.**	502
TASK TITLE	PERFORM PACKAGING OF PROCESSED PRODUCT	**TASK NO.**	5022
PERFORMANCE CRITERIA	The person performing this task must be able to apply knowledge and skills to perform packaging of processed product as per approved standards and procedures.		
RANGE STATEMENT	The task will be performed at the end of AP processing under minimum supervision of an Engineer. The following equipment, tools and materials will be needed in performing the task: PPEs, computers, stationery, conveyor, forklifts, carts, sorters, picking system, pallets, elevators, trays.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Prepare tools, equipment, safety gear and materials to be used; 2. Identify characteristics of processed AP to be packed; 3. Determine the quantity/size of product to be packed; 4. Establish methods of packaging for given processed product; 5. Select proper method of packaging; 6. Observe aseptic conditions of packaging; 7. Differentiate acceptable and unacceptable product according to standards; 8. Carry out packaging of acceptable product; 9. Complete forms, records and other documentations; 10. Observe health and safety when performing the task; 11. Clean working tools and equipment; 12. Store tools, equipment and safety gear; 13. Keep the production line clean and organized; 14. Check package labelling information with inside product;	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Operate packaging machines; 1.2. Select handling equipment; 1.3. Handle processed product; 1.4. Execute standard operating procedures; 1.5. Maintain handling equipment. **2.0. Principles** The person must be able to explain the principles of: 2.1. GMP; 2.2. HACCP; 2.3. SOPs; 2.4. 5S site management. **3.0. Theories:** The person must be able to explain: 3.1. Properties of packaging materials; 3.2. Material handling; 3.3. Packaging theory for different AP; 3.4. Ergonomics; 3.5. Unit load Automation; 3.6. Self safety protection and rescue awareness. **4.0. Essential skills** 4.1. Teamwork skills; 4.2. Basic mathematics; 4.3. Measurements and units; 4.4. Communication skills; 4.5. Integrity and responsibility; 4.6. Computer skills;

15. Conduct testing process according to SOPs and keep work records.	4.7. Problem solving skills; 4.8. Material handling; 4.9. Safety production awareness; 4.10. Cost saving awareness.
DESCRIPTION OF THE END PRODUCTS	Packaging of processed product is performed as per standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safe handling of equipment and tools; 2. Extent of responsibility; 3. Good manufacturing Practices; 4. Occupational safety and health; 5. House Keeping.

OCCUPATION	BIOPROCESS TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CONDUCT PACKAGING OF PROCESSED PRODUCT	**DUTY NO.**	502
TASK TITLE	INSPECT PACKAGED PRODUCT AGAINST STANDARDS	**TASK NO.**	5023
PERFORMANCE CRITERIA	The person performing this task must be able to apply knowledge and skills to inspect packaged products against approved standards.		
RANGE STATEMENT	The task will be performed during and after packaging under minimum supervision of an Engineer. The following tools, equipment and safety gear will be needed to accomplish this task: package testing machine, operation manuals gloves, masks, computer, stationery, printer, weight balance, forms and logs.		

EVIDENCEREQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Prepare tools, equipment, safety gear and materials to be used; 2. Establish standards parameters to be checked; 3. Verify manufacturing date; 4. Check expiring date; 5. Verify tightness of lid; 6. Check physical appearance of finished product; 7. Verify weight/volume of finished product; 8. Complete forms, records and other documentation; 9. Observe health and safety when performing the task; 10. Clean working tools and equipment; 11. Store tools, equipment and safety gear appropriately; 12. Keep the working area clean and organized; 13. Check weight/volume difference of the same patch product; 14. Conduct inspecting process according to SOPs and keep work records.	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Inspect packaged agricultural products; 1.2. Identify critical control limits; 1.3. Execute a Standard Operating Procedure. **2.0. Principles** The person must be able to explain the principles of: 2.1. Packaging APs; 2.2. HACCP; 2.3. GMPs; 2.4. SOPs; 2.5. 5S site management. **3.0. Theories** The person must be able to explain: 3.1. Quality control (QC); 3.2. Quality Assurance (QA); 3.3. Manufacturing KPIs; 3.4. Weights and measurements; 3.5. Loading difference check. **4.0. Essential skills** 4.1. Teamwork skills; 4.2. Communication skills; 4.3. Result oriented way of working; 4.4. Report writing skills; 4.5. Analytical skills;

	4.6. Curiosity; 4.7. Commitment; 4.8. Time management; 4.9. Trustworthy; 4.10. Computer skills.
DESCRIPTION OF THE END PRODUCTS	Inspection of packed agricultural products against set standards is performed as per approved standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Standard Operation Procedure; 2. ISO standards; 3. National Standards (TBS) ; 4. Handling of equipment and tools; 5. Occupational safety and health.

OCCUPATION	BIOPROCESS TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CONDUCT QUALITY TEST OF PROCESSED PRODUCT	**DUTY NO.**	503
TASK TITLE	PREPARE SAMPLE FOR QUALITY TEST	**TASK NO.**	5031
PERFORMANCE CRITERIA	The person performing this task must be able to prepare sample for quality test as per given standards and procedures.		
RANGE STATEMENT	The task will be performed in AP processing facility under supervision of an Engineer. The following equipment, tools and materials will be needed in performing the task: sample divider, mask, hair nets, plastic gloves reflectors, timer, overcoat and stationery.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Establish sampling methods; 2. Select suitable sampling methods. 3. Select suitable sampling equipment; 4. Establish sampling points (critical points) ; 5. Determine frequency of sampling; 6. Determine time interval to take sample; 7. Collect samples for lab testing; 8. Keep records of samples collected; 9. Clean sampling tools and equipment; 10. Store cleaned tools and equipment appropriately; 11. Observe health and safety status when performing the task; 12. Data recording and sorting (using excel or other tools).	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Take sample; 1.2. Select sampling tools and equipment. **2.0. Principles** The person must be able to explain the principles of: 2.1. Sampling; 2.2. HACCP; 2.3. GMPs. **3.0. Theories** The person must be able to explain: 3.1. Procedures for storing samples; 3.2. Food security; 3.3. Quality assurance; 3.4. Quality control; 3.5. Sampling techniques; 3.6. Food control systems; 3.7. Statistics. **4.0. Essential skills** 4.1. Teamwork skills; 4.2. Commitment; 4.3. Communication skills; 4.4. Integrity and responsibility; 4.5. Trustworthy; 4.6. Measurement and units; 4.7. Readiness to implement knowledge; 4.8. Time management skills;

	4.9. Computer skills.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Sample for quality test is prepared as per approved standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational safety and health; 2. Safe handling of equipment and tools; 3. Standard operating procedures; 4. HACCP guidelines and procedures.

OCCUPATION	BIOPROCESS TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CONDUCT QUALITY TEST OF PROCESSED PRODUCT	**DUTY NO.**	503
TASK TITLE	PERFORM QUALITY TEST OF PROCESSED PRODUCT	**TASK NO.**	5032
PERFORMANCE CRITERIA	The person performing this task must be able to perform quality test of processed product as per approved standards and procedures.		
RANGE STATEMENT	The task will be performed in the factory/laboratory under supervision of an Engineer. The following equipment, tools and materials will be needed in performing the task: PPEs (mask, hair nets, plastic gloves, goggles, safety boot, lab coat), stopwatch, tape measure, telescoping gauge, reagents and operating manuals.		

EVIDENCE REQUIREMENTS	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Obtain samples of AP; 2. Select tools, equipment and safety gear to perform task; 3. Establish quality parameters to be tested; 4. Select proper method for testing; 5. Condition AP sample for required test as per standard procedure; 6. Prepare instruments to be used in the test process; 7. Calibrate instruments to be used; 8. Carry out tests as per standard procedures; 9. Record test results; 10. Follow SOP to maintain condition of the sample; 11. Follow SOP to store sample for further testing; 12. Clean tools and equipment; 13. Observe safety and health precautions in the lab testing area. 14. Clean working area; 15. Store tools, equipment and safety gear as per standards.	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1. Track Lot Number/batch number of a finished product; 1.2. Carry out lab test; 1.3. Calibrate instruments; 1.4. Handle samples; 1.5. Determine whether the product is qualified according to the identification result; 1.6. Analyse and judge the quality problems in the production process; 1.7. Use common instruments and equipment to carry out quality inspection on processed products. **2.0. Principles** The person must be able to explain the principles of: 2.1. HACCP; 2.2. Good Laboratory practices (GLPs). **3.0. Theories** The person must be able to explain: 3.1. Testing methods; 3.2. Calibration procedure for test equipment; 3.3. Preparation of standard chemical reagents for testing; 3.4. Tools, equipment/apparatus and instrument handling;

	3.5. Different quality management systems; 3.6. Lab rules and guidelines; 3.7. Operation of different lab instruments; 3.8. Safety of a finished product; 3.9. Basic sciences (bio-chemistry, biology) and mathematics; 3.10. Material handling; 3.11. Quality inspection standard for different AP; 3.12. Common quality problems of processed products; 3.13. The treatment of reagents and lab waste water; 3.14. Laboratory culture safety of microorganisms. **4.0. Essential skills** 4.1. Teamwork skills; 4.2. Communication skills; 4.3. Response to emergencies; 4.4. Integrity and responsibility; 4.5. Computer skills; 4.6. Measurement and units; 4.7. Readiness to implement knowledge; 4.8. Time management skills; 4.9. Problem solving skills; 4.10. Analytical skills; 4.11. Commitment; 4.12. Trustworthy.
DESCRIPTION OF THE END PRODUCTS	Quality test of processed product is performed as per approved standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational safety and health; 2. Safe handling of equipment and tools; 3. Extent of responsibility; 4. National standards (TBS) ; 5. International standards (ISO) ; 6. Hazard Analysis critical control point.

OCCUPATION	BIOPROCESS TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CONDUCT QUALITY TEST OF PROCESSED AGRICULTURAL PRODUCE (AP)	**DUTY NO.**	503
TASK TITLE	PREPARE REPORT FOR QUALITY TEST OF PROCESSED AP	**TASK NO.**	5033
PERFORMANCE CRITERIA	The person performing this task must be able to prepare reports for quality test of processed AP as per given standards and procedures.		
RANGE STATEMENT	The task will be performed in the factory under supervision of an Engineer. The following equipment, tools and materials will be needed in performing the task: stationery, timer, printer, calculator.		

EVIDENCE REQUIREMENTS

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Prepare tools, equipment, safety gear and materials to be used; 2. Identify type of processed AP; 3. Record batch number; 4. Record name of product; 5. Record net weight of the processed AP; 6. Record results of quality test for each parameter; 7. Document verification statements; 8. Observe health and safety when performing the task; 9. Clean working tools and equipment; 10. Keep working area clean and organized.	**Detailed knowledge about:** **1.0. Methods** The person performing this task must be able to explain how to: 1.1 Write report document; 1.2 Use excel software; 1.3 Execute a Standard Operating Procedure. **2.0. Principles** The person must be able to explain the principles of: 1.1 Accountability; 1.2 Transparency; 1.3 GMPs; 1.4 SOPs. **3.0. Theories** The person must be able to explain: 3.1. Records Continuum theory; 3.2. Record management theory; 3.3. Accounting records; 3.4. Data recording specification. **4.0. Essential skills** 4.1. Communication skills; 4.2. Report writing skills; 4.3. Teamwork skills; 4.4. Commitment; 4.5. Motivation skills; 4.6. Reading and understanding skills;

	4.7. Reliability; 4.8. Integrity; 4.9. Computer skills; 4.10. Trustworthy; 4.11. Measurement and units conversion skills; 4.12. Readiness to implement knowledge; 4.13. Time management skills.
DESCRIPTION OF THE END PRODUCTS / SERVICE	Report for quality test of a processed AP is prepared as per approved standards and procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational safety and health; 2. Safe handling of equipment and tools; 3. Standard operating procedures; 4. Company's quality policies and acceptance; standards for processed AP; 5. ISO standard; 6. National Standards.

TABLE 1: DACUM CHARTS FOR BIOPROCESS TECHNICIAN – LEVEL 5

DUTIES	TASK	ENABLERS
1.0. Monitor production operations of the AP	1.1. Control production process of AP. 1.2. Control performance of AP processing machine. 1.3. Maintain quality of incoming, in process and finished products.	**General skills and knowledge** • Leadership skills • Communication skills both verbal and written skills • Organization skills • Safety skills • Analysis skills **Tools and equipment** • Stationaries • Operational manuals • Stop watch • Weigh balance • Sample probes • Production equipment **Worker's Behaviour** • Time management • Team work • Trustworthy • Motivation • Commitment • Environment protection
2.0 Conduct packaging of processed product	**2.1** Prepare packaging materials of produced product. **2.2** Perform packaging of processed product. **2.3** Inspect packaged product against standards.	**General skills and knowledge** • Leadership skills • Communication skills both verbal and written skills • Organization skills • Safety skills • Analysis skills **Tools and equipment** • Stationaries • Operational manuals • Packaging materials • Packaging machine **Worker's Behaviour** • Time management • Team work • Trustworthy • Motivation

		• Commitment
		General skills and knowledge • Leadership skills • Communication skills both verbal and written skills • Organization skills • Safety skills Analysis skills **Tools and equipment** • Stationaries • Operational manuals • Packaging materials • Packaging machine **Worker's Behaviour** • Time management • Team work • Trustworthy • Motivation • Commitment
		General skills and knowledge • Leadership skills • Communication skills both verbal and written skills • Organization skills • Safety skills • Analysis skills **Tools and equipment** • Stationaries • Operational manuals • Computer • Test equipment **Worker's Behaviour** • Time management • Team work • Trustworthy • Motivational Commitment
3.0 Conduct quality test of processed product	**3.1** Prepare sample for quality test. 3.2 Perform quality test of processed product.	**General skills and knowledge** • Leadership skills • Communication skills both verbal and written skills • Organization skills

	3.3 Prepare report for quality test of processed AP.	• Safety skills • Analysis skills **Tools and equipment** • Stationaries • Operational manuals • Stop watch • Weigh balance • Sample probes • Computer **Worker's Behaviour** • Time management • Team work • Trustworthy • Motivation • Commitment
		General skills and knowledge • Leadership skills • Communication skills both verbal and written skills • Organization skills • Safety skills • Analysis skills **Tools and equipment** • Stationaries • Operational manuals • Stop watch • Weigh balance • Sample probes • Test equipment **Worker's Behaviour** • Time management • Team work • Trustworthy • Motivational • Commitment • Environment protection
		General skills and knowledge • Leadership skills • Communication skills both verbal and written skills • Organization skills

		• Safety skills • Analysis skills **Tools and equipment** • Stationaries • Operational manuals • Stop watch • Weigh balance • Sample probes • Computer **Worker's Behaviour** • Time management • Team work • Trustworthy • Motivational • Commitment