

Mapping Organic Farming Occupations: Bridging Competency Gaps and Addressing Generational Challenges

Surono

Universitas Asa Indonesia, Indonesia
Email: surono.ckp@gmail.com

ABSTRACT: This This research aims to address the gap between the competencies required by the organic farming sector and the skills provided by educational institutions in Indonesia. By mapping occupations within the Indonesian Qualification Framework (IQF) and using the Rapid Assessment Process (RAP) along with the Regional Model Competency Standard (RMCS), the study identifies key roles and competencies necessary for the industry, ranging from entry-level workers to advanced specialists. The findings suggest that current curricula fail to integrate advanced technologies and practical skills training needed in organic farming. The study proposes curriculum enhancements that incorporate sustainable farming practices, biochar technology, and entrepreneurial education to align with industry demands. A strategic framework is also introduced to address the generational gap in the sector by modernizing the perception of farming and attracting younger talent through digital engagement and innovative educational approaches. The research highlights the importance of bridging the competency gap and fostering a skilled workforce capable of driving sustainable agricultural practices, ultimately strengthening the organic farming sector and ensuring its long-term viability.

Keywords: organic farming, qualification framework, occupation mapping, educational outcomes, generational challenges

INTRODUCTION

Organic farming is globally recognized for its emphasis on sustainable practices that enhance soil health, protect the environment, and promote biodiversity, while also contributing to the Green Jobs sector. According to Giri & Pokhrel, (2022), organic farming significantly reduces the risk of adverse environmental effects compared to conventional methods, improving soil fertility, nutrient management, and biodiversity preservation. Stanef-Puică et al., (2022) highlights those green jobs, including those in organic farming, play a vital role in maintaining and restoring environmental quality by minimizing pollution, reducing energy use, and promoting ecosystem restoration. Similarly, Dhiman, (2020) notes that the European Union identifies organic farming as a cornerstone of sustainable food systems, helping mitigate climate change and restore ecosystems under the Green Pact.

The Qualification Framework plays a crucial role in ensuring that education and training programs develop skills aligned with industry needs, particularly in organic farming. According to EUROPEAN COMMISSION, (2023), the European Union promotes skill alignment in organic farming through the Common Agricultural Policy (CAP), supported by training and knowledge-sharing initiatives under Horizon Europe and EIP-AGRI frameworks. These efforts ensure that

educational programs address the skill demands of sustainable farming systems. Similarly, Lenz et al., (2021) highlights that Turkey's Organic Agriculture Action Plan prioritizes training and extension services to align farmers' skills with the standards and demands of organic agriculture.

Occupation mapping is essential for identifying roles in organic farming and guiding skill development through targeted education and training programs. According to Maas et al., (2020), the lack of appropriate technology and technical assistance underscores the need to clearly define occupational roles in organic farming, enabling the identification of specific training needs to improve productivity and working conditions. Tangkesalu et al., (2022) highlights how training programs have addressed gaps in areas such as organic compost and pesticide production, helping farmers adopt sustainable practices. Willer et al., (2024) emphasizes that tailored education and training programs are critical for bridging disparities between conventional and organic farming, ensuring targeted skill development for specific occupations.

Research Gap

A significant gap exists between the skills demanded by the organic farming industry and the educational outcomes of academic institutions, leaving graduates unprepared for the job market. This research addresses this issue by systematically mapping occupations within the organic farming sector using the qualification framework and aligning these roles with industry needs. Through the Regional Model Competency Standard (RMCS), the study identifies key roles, required competencies, and provides recommendations for curriculum enhancements aimed at better preparing graduates for the workforce.

The research aims to map occupations in the organic farming sector, develop a model that aligns educational learning outcomes with industry needs, and formulate curriculum recommendations to enhance relevance and interest. Additionally, it seeks to propose a strategic framework to address the generational gap in the organic agricultural sector, ensuring sustainability and continuous workforce development.

LITERATURE REVIEW

Philosophy

Organic farming is grounded in principles that prioritize ecological balance, biodiversity, and the health of soils, ecosystems, and people. The International Federation of Organic Agriculture Movements (IFOAM) outlines four core principles: Health, Ecology, Fairness, and Care. These principles serve as the foundation for organic agriculture, guiding its development and implementation worldwide (Willer et al., 2024).

Theoretical Concepts

The theoretical framework of organic farming emphasizes systems thinking, where the farm is viewed as a holistic entity. This perspective involves understanding the complex interactions between soil, plants, animals, and humans. Key theoretical concepts include agroecology, which studies ecological processes applied to agricultural production systems, and the emphasis on closed nutrient cycles to minimize external inputs and environmental impact (FiBL, 2021).

General Concepts for Development organic farming occupation into a Qualification Framework (IFOAM, 2022) include: Systemic Approach, Competency Development, Alignment with Climate and Biodiversity Goals, Incorporation of Policy and Standards, and Support for Public Goods.

RESEARCH METHODOLOGY

The research employed the Rapid Assessment Process (RAP) (Beebe, 2005), combined with the ILO framework Regional Model Competency Standard (ILO, 2016), to systematically collect and analyze data for developing competency standards in the organic farming sector. It unfolded in several phases, starting with the preparation phase, where objectives were clarified, and collaboration with key stakeholders, including organic farmers, industry professionals, educators, and policymakers, was established to identify competency gaps and industry needs.

RESULT AND DISCUSSION

The occupations map of organic farming within national qualification framework.

The results of this study highlight the current alignment between organic farming occupations and the Indonesian Qualification Framework (IQF). Table 1 provides a detailed occupation map within the organic farming sector, categorized according to different IQF levels. The occupation hierarchy ranges from general labor roles at the lowest level to senior specialist roles at higher levels, with each role aligned to specific competencies that reflect increasing complexity and responsibility. For example, Level IX roles such as Senior Soil Health Specialist require strategic and leadership competencies, while Level I roles like Soil Preparation Laborer focus on basic operational tasks. This structured mapping offers a clear framework for curriculum development, ensuring that students acquire the necessary skills to advance through the industry, from foundational roles to leadership positions.

Table 1. Map of Organic farming Occupation Map within Qualification Framework

IQF LEVEL	OCCUPATION
IX	Senior Specialist in Organic farming, Director of Organic farming Development, Senior Soil Health Specialist, Senior Biochar Farming Specialist
VIII	Organic Farming Specialist, Manager of Organic Certification Programs, Soil Health and Restoration Specialist, Biochar Project Manager
VII	Agricultural Extension Specialist in Organic Farming, Organic Farm Manager, Quality Control Specialist in Organic farming, Organic Soil Quality Control Specialist, Soil Regeneration Program Manager, Biochar Production Specialist
VI	Organic farming Project Coordinator, Organic Crop Specialist, Agricultural Consultant for Organic Farming, Organic farming Lead Inspector, Organic Farming Facilitator, Soil Health Coordinator, Organic Soil Scientist, Biochar Farming Coordinator, Biochar Application Consultant
V	Organic Farming Technician, Organic Soil Analyst, Organic farming Inspector, Soil Health Technician, Organic Soil Analyst (spesifik untuk analisis regenerasi), Biochar Production Technician, Biochar Specialist Assistant.
IV	Organic Farm Worker, Organic Produce Handler, Greenhouse Technician, Organic farming Junior Inspector, Soil Health Worker, Organic Compost Handler (khusus untuk perbaikan tanah), Biochar Farm Worker, Biochar Technician
III	Organic Farm Assistant, Irrigation Technician, Organic Greenhouse Worker, Junior Soil Health Assistant, Biochar Farming Assistant
II	Organic Farm Laborer, Packaging Assistant, Nursery Assistant, Soil Fertility Assistant, Biochar Processing Laborer.
I	General Farm Worker, Organic Compost Assistant, Field Hand, Soil Preparation Laborer, Biochar Handling Laborer.

Table 2 outlines the highest-level occupations in organic farming, requiring advanced expertise and leadership skills. Occupations such as Senior Specialist in Organic Farming and Director of Organic Farming Development emphasize strategic leadership, research, and the development of sustainable farming practices. These roles are critical for shaping the future of organic farming at a macro level, influencing policies and setting industry standards. Competencies at this level focus on leading large-scale projects, managing research teams, and ensuring that innovative practices are integrated into the industry.

Table 2. Occupation map and its competence in Organic farming within IQF level 9

OCCUPATION AND ITS DESCRIPTION	COMPETENCE/TASKS
Senior Specialist in Organic farming: is a leading expert in organic farming leading the research, development and application of best practices in the field.	<ul style="list-style-type: none"> • Leading in-depth research in the latest organic farming techniques and practices. • Developing and implementing innovative technologies to increase the productivity and sustainability of organic farming. • Writing and publishing research results in national and international scientific journals. • Providing guidance to junior research teams and graduate students in research projects. • Collaborate with other research and educational institutions to develop joint projects. • Advising agricultural companies and governments on organic farming best practices. • Develop and submit research proposals to obtain funding from national and international sources.
Director of Organic farming Development: is a strategic leader who directs the development and implementation of organic farming programs to achieve sustainability and efficiency goals.	<ul style="list-style-type: none"> • Designing and implementing strategic plans for the development of organic agriculture. • Oversee and manage organic farming development projects to ensure the achievement of goals. • Conduct periodic evaluations and monitoring of the programs carried out to ensure success and sustainability. • Develop policies and procedures to support effective organic farming practices. • Establish and maintain relationships with stakeholders, including governments, non-profit organizations, and the private sector. • Conduct counseling and education campaigns to increase awareness and adoption of organic farming practices. • Manage human, financial, and material resources to support the implementation of organic farming programs.
Senior Soil Health Specialist: The Senior Soil Health Specialist is responsible for developing policies, strategies, and technologies in the field of soil health at the national or international level.	<ul style="list-style-type: none"> • Design sustainable soil health policies and programs. • Develop national/international standards for soil health management. • Oversee research and development of soil improvement technologies. • Provide strategic recommendations on soil policy to governments or organizations. • Lead expert teams in implementing soil health programs. • Collaborate across sectors to ensure effective implementation of soil health policies. • Evaluate the long-term environmental impact of soil health policies.
Senior Biochar Farming Specialist: The Senior	<ul style="list-style-type: none"> • Develop strategies and national policies for implementing biochar technologies in agriculture.

Biochar Farming Specialist is responsible for leading the development, application, and management of biochar technologies and practices in large-scale farming or national-level projects.	<ul style="list-style-type: none"> • Lead research and development in biochar production and application techniques. • Oversee large-scale biochar projects, ensuring compliance with environmental standards. • Collaborate with governmental and international organizations to promote biochar use. • Provide expert advice on the environmental benefits and economic feasibility of biochar farming. • Design and supervise training programs for biochar specialists and farmers. • Analyze the long-term impacts of biochar on soil health and climate change mitigation. • Publish research findings and reports on biochar farming outcomes.
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Table 3 presents occupations at IQF Level 8, which combine technical expertise with managerial responsibilities. Positions such as Specialist in Organic Farming and Manager of Organic Certification Programs require professionals to have deep technical knowledge and the ability to manage teams or programs. Competencies focus on providing technical solutions to farming challenges, conducting training sessions, and ensuring that organic farming practices meet both national and international standards.

Table 3. Occupation map and its competence in Organic farming within IQF level 8

OCCUPATION AND ITS DESCRIPTION	COMPETENCE/TASKS
A Specialist in Organic Farming: is a professional who has in-depth expertise in organic farming techniques and practices, providing technical support and training to farmers.	<ul style="list-style-type: none"> • Provide technical solutions to the challenges farmers face in organic farming practices. • Train farmers and farm workers on the latest organic farming techniques and methods. • Develop and update organic farming methods based on the latest research. • Evaluate organic farming practices implemented to ensure effectiveness and efficiency. • Conduct field research and analysis to improve the productivity and sustainability of organic farming. • Providing consultation to agricultural organizations and governments on organic farming policies and strategies. • Initiating and developing new projects to increase the adoption of organic farming in local communities.
Manager of Organic Certification Programs: is a manager who oversees the organic certification process, ensuring compliance with national and international standards.	<ul style="list-style-type: none"> • Ensure all organic certification processes are carried out in accordance with national and international standards. • Lead the team responsible for organic certification audits and inspections. • Develop and update organic certification standards based on regulatory changes and best practices. • Train auditors and inspectors on organic certification procedures and criteria. • Ensure that all certified entities comply with applicable organic regulations. • Prepare and manage documentation and reports related to the organic certification process. • Build and maintain relationships with stakeholders, including farmers,

	companies, and regulatory bodies, to support certification programs.
Soil Health and Restoration Specialist: The Soil Health and Restoration Specialist leads soil restoration projects, focusing on improving the quality of degraded or damaged soils.	<ul style="list-style-type: none"> • Design and manage organic soil restoration projects. • Develop techniques to enhance soil health through organic approaches. • Oversee the implementation of soil health practices in the field. • Conduct in-depth analysis of soil conditions before and after restoration. • Provide technical training to farmers and stakeholders on soil health practices. • Collaborate with farmers and stakeholders to apply soil health techniques. • Produce reports and recommendations on the success of restoration projects.
Biochar Project Manager: The Biochar Project Manager oversees the execution of biochar farming projects, managing resources, timelines, and collaborations with stakeholders to ensure the successful integration of biochar into agricultural practices.	<ul style="list-style-type: none"> • Plan and implement biochar farming projects from initiation to completion. • Manage project budgets, schedules, and resources to ensure efficient project execution. • Coordinate with farmers, researchers, and government agencies to ensure smooth project operations. • Monitor and report on the progress and effectiveness of biochar applications in the field. • Conduct risk assessments and develop contingency plans to address project challenges. • Provide technical support and guidance to project staff and stakeholders. • Ensure adherence to environmental and safety regulations related to biochar production and use. • Evaluate project outcomes and make recommendations for future improvements.

Table 4 details the occupations within IQF Level 7, which include roles such as Agricultural Extension Specialist in Organic Farming and Organic Farm Manager. These roles are essential for bridging the gap between research and practice, ensuring that organic farming methods are effectively communicated to farmers. Competencies at this level focus on training, advising, and managing daily farm operations.

Table 4. Occupation map and its competence in Organic farming within IQF level 7

OCCUPATION AND ITS DESCRIPTION	COMPETENCE/TASKS
Agricultural Extension Specialist in Organic Farming: is a specialist who provides guidance and training to farmers on organic farming techniques through extension programs.	<ul style="list-style-type: none"> • Provide technical guidance to farmers on effective organic farming methods. • Organizing and organizing trainings and workshops to increase farmers' knowledge. • Developing educational and counseling materials on organic farming practices. • Conduct field demonstrations to demonstrate organic farming techniques. • Providing direct consultation to farmers regarding the specific problems they face. • Evaluate the effectiveness of the extension program and make recommendations for improvement.

	<ul style="list-style-type: none"> • Collaborate with research and educational institutions to promote organic farming.
An Organic Farm Manager: is the manager responsible for the day-to-day operations of an organic farm, ensuring efficient practices and compliance with organic standards.	<ul style="list-style-type: none"> • Supervise and manage the daily operations of organic farming. • Plan planting and harvesting schedules to ensure maximum productivity. • Manage human, financial, and material resources in agriculture. • Ensure that all farming practices comply with applicable organic standards. • Oversee product quality and production processes to ensure the final product meets quality standards. • Prepare daily, weekly, and monthly reports on farm performance. • Ensure farm equipment is in good condition and perform regular maintenance.
Quality Control Specialist in Organic farming: is a specialist who oversees the quality and safety of organic agricultural products through regular inspections and testing.	<ul style="list-style-type: none"> • Conduct regular inspections of the production process and final products to ensure quality. • Testing organic agricultural products to ensure there is no contamination and complies with organic standards. • Develop and update quality protocols for different stages of production. • Documenting inspection and testing results and creating detailed reports. • Conduct internal audits to ensure compliance with organic standards and regulations. • Train employees on the importance of quality and procedures to follow. • Solve quality problems that arise and implement corrective actions.
Organic Soil Quality Control Specialist: This specialist is responsible for overseeing the quality of organic soils, ensuring that they meet health and productivity standards.	<ul style="list-style-type: none"> • Conduct periodic inspections of organic soil quality. • Prepare soil quality assessment reports based on applicable standards. • Develop more efficient soil quality testing methods. • Analyze soil improvement needs and recommend solutions. • Ensure that organic standards are applied in soil health practices. • Train field workers on soil quality measurement and monitoring techniques. • Collaborate with soil inspectors to ensure compliance with environmental regulations.
Soil Regeneration Program Manager: The Soil Regeneration Program Manager oversees the development and execution of programs aimed at restoring and improving soil health, focusing on sustainable practices to regenerate degraded soils.	<ul style="list-style-type: none"> • Design and implement soil regeneration programs to restore degraded soils. • Coordinate with stakeholders (government, farmers, environmental groups) to ensure program alignment with local needs. • Monitor the progress and outcomes of soil regeneration projects, ensuring targets are met. • Develop policies and best practices for soil restoration that comply with environmental standards. • Conduct impact assessments to measure the effectiveness of soil regeneration initiatives. • Lead research efforts to identify new technologies or methods for improving soil regeneration. • Provide training and workshops for farmers and field workers on soil restoration techniques.
Biochar Production Specialist: The Biochar Production Specialist is	<ul style="list-style-type: none"> • Operate and manage biochar production equipment and facilities. • Ensure that biochar production follows sustainable and environmentally friendly practices.

responsible for managing the production of biochar from organic materials, ensuring the quality and efficiency of the production process, and optimizing the use of biochar in agricultural applications.	<ul style="list-style-type: none"> • Optimize the process of converting biomass into biochar, maximizing output and quality. • Test the quality of biochar produced and adjust production parameters as needed. • Collaborate with farmers to determine the best biochar application methods for specific crops. • Train workers on biochar production techniques and equipment maintenance. • Monitor and reduce the environmental impact of biochar production processes. • Maintain detailed records of production data and quality control results.
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Table 5 focuses on occupations at IQF Level 6, such as Organic Farming Project Coordinator and Agricultural Consultant for Organic Farming, which are centered around organizing, implementing, and evaluating organic farming projects. These roles require a balance between hands-on expertise and project management skills, ensuring that organic farming initiatives are successful from planning through execution.

Table 5. Occupation map and its competence in Organic farming within IQF level 6

OCCUPATION AND ITS DESCRIPTION	COMPETENCE/TASKS
Organic farming Project Coordinator: is a coordinator who organizes and manages organic farming projects, including planning, implementation, and evaluation.	<ul style="list-style-type: none"> • Develop work plans for organic farming projects. • Oversee the implementation of the project in accordance with the plan that has been prepared. • Manage human, financial, and material resources for projects. • Coordinate the project team and ensure all members work effectively. • Monitor project progress and conduct evaluations to ensure the achievement of objectives. • Compile progress reports and project results for stakeholders. • Identify and resolve issues that arise during project execution.
An Organic Crop Specialist: is an expert who focuses on organic crop production, providing technical recommendations to improve crop yields and plant health.	<ul style="list-style-type: none"> • Developing and implementing effective organic plant cultivation techniques. • Provide technical recommendations to farmers to improve crop productivity and health. • Monitor plant growth and diagnose any problems that may arise. • Conducting research to find new methods in organic plant cultivation. • Develop environmentally friendly pest and disease control strategies. • Train farmers on organic crop cultivation techniques. • Evaluate crops and provide suggestions for future improvements.
Agricultural Consultant for Organic Farming: is a consultant who provides strategic advice to farmers and agricultural organizations on organic farming practices and techniques.	<ul style="list-style-type: none"> • Provide strategic advice to farmers and organizations on organic farming practices. • Analyze agricultural businesses to improve efficiency and sustainability. • Assist in the development of business and operational plans for organic farming. • Providing solutions to problems faced by farmers in organic farming practices. • Provide training and education to farmers on organic farming techniques. • Evaluate agricultural performance and provide recommendations for

	<p>improvement.</p> <ul style="list-style-type: none"> • Assist in the development of agricultural policies that support organic farming.
<p>Organic farming Lead Inspector: is the lead inspector who leads the team in conducting inspections and audits on organic farming operations to ensure compliance.</p>	<ul style="list-style-type: none"> • Lead the team in conducting inspections and audits on organic farming operations. • Assess compliance with organic standards and regulations. • Prepare a report of findings and recommendations from the inspection. • Recommending the granting of organic certification based on the results of the inspection. • Develop and update inspection protocols and procedures. • Train junior inspectors on inspection procedures and standards. • Resolve compliance issues that arise during inspections.
<p>Organic farming Facilitators: are facilitators who assist in the implementation of organic farming practices through training, workshops, and mentoring programs.</p>	<ul style="list-style-type: none"> • Lead the team in conducting inspections and audits on organic farming operations. • Assess compliance with organic standards and regulations. • Prepare a report of findings and recommendations from the inspection. • Recommending the granting of organic certification based on the results of the inspection. • Develop and update inspection protocols and procedures. • Train junior inspectors on inspection procedures and standards. • Resolve compliance issues that arise during inspections.
<p>Soil Health Coordinator: The Soil Health Coordinator manages multiple soil health projects in different locations, focusing on sustainable soil management.</p>	<ul style="list-style-type: none"> • Coordinate teams in implementing soil improvement activities across different sites. • Monitor and evaluate soil health regularly. • Develop soil quality improvement programs based on local conditions. • Conduct internal audits of soil health practices in the field. • Provide training to field workers on best soil health practices. • Develop contingency plans for emergency situations related to soil quality. • Communicate with local stakeholders to align project goals and needs.
<p>Organic Soil Scientist: The Organic Soil Scientist conducts research and experiments to improve the understanding of soil health in organic farming systems.</p>	<ul style="list-style-type: none"> • Conduct field and laboratory research on soil properties in organic farming systems. • Analyze the interaction between soil microorganisms and organic matter to improve soil health. • Develop sustainable soil management practices to maintain fertility and reduce soil degradation. • Provide expert recommendations on organic fertilization and crop rotation for improved soil health. • Collaborate with farmers and agricultural agencies to implement research findings in the field. • Monitor the long-term effects of organic farming practices on soil health and provide feedback for improvement.
<p>Biochar Farming Coordinator: The Biochar Farming Coordinator coordinates the application of biochar in farming activities, working with field teams to ensure</p>	<ul style="list-style-type: none"> • Coordinate field activities related to biochar application on farms. • Train farmers and workers on the correct methods of biochar incorporation into the soil. • Monitor the effects of biochar on soil health and crop performance. • Collect data from field trials and provide feedback to project managers and specialists. • Assist in the distribution and transport of biochar to farming locations. • Ensure compliance with agricultural guidelines and safety standards in

proper use of biochar to improve soil health and crop yields.	biochar application.
Biochar Application Consultant: The Biochar Application Consultant provides expert advice and technical guidance to farmers, organizations, and projects on the best practices for applying biochar in agriculture to improve soil health and crop yields.	<ul style="list-style-type: none"> • Evaluate the cost-effectiveness of biochar use in different farming systems. • Analyze soil conditions and recommend appropriate biochar application rates and methods. • Conduct field assessments to determine the most effective biochar integration strategies for specific crops or climates. • Advise farmers on how to incorporate biochar into their existing soil management practices. • Provide training and workshops on biochar application techniques for agricultural workers and farm managers. • Monitor and evaluate the effects of biochar on soil properties and crop performance over time. • Collaborate with agricultural researchers to implement new biochar technologies and improve application methods. • Develop customized biochar application plans for large-scale farms and specific crop types.

Table 6 identifies occupations such as Organic Farming Technician and Organic Soil Analyst, which focus on implementing organic farming techniques and maintaining soil health. These positions require practical skills in managing crops, applying fertilizers, and monitoring soil conditions. The Biochar Production Technician and Biochar Specialist Assistant roles are vital for biochar production and application, ensuring that biochar is used effectively to improve soil quality.

Table 6. Occupation map and its competence in Organic farming within IQF level 5

OCCUPATION AND ITS DESCRIPTION	COMPETENCE/TASKS
Organic Farming Technician: is a technician who assists in the implementation and maintenance of organic farming practices, including land and crop management.	<ul style="list-style-type: none"> • Carry out regular maintenance of agricultural land to ensure optimal conditions for organic plant growth. • Implementing various organic farming techniques and methods in the field. • Managing organic crops including planting, maintenance, and harvesting. • Operate and maintain organic farming equipment in accordance with operational standards. • Apply organic fertilizers and pesticides in accordance with the established procedures. • Collect data on plant and soil conditions for monitoring and evaluation purposes. • Compile daily or weekly reports on agricultural activities and conditions.
An Organic Soil Analyst: is an analyst who tests and evaluates	<ul style="list-style-type: none"> • Conducting soil testing to measure nutrient content and fertility levels. • Evaluate the test results to determine the optimal conditions for

soil to ensure optimal conditions for organic plant growth.	<ul style="list-style-type: none"> organic plant growth. • Providing fertilization recommendations based on the results of soil analysis. • Monitor changes in soil fertility over time to ensure conditions remain optimal. • Developing sustainable and environmentally friendly land management strategies. • Prepare a report on the results of soil analysis for use by farmers and agricultural managers. • Providing consultation to farmers on how to best manage their land for organic farming.
An organic farming inspector: is an inspector who inspects organic farming operations to ensure that they meet the established standards and regulations.	<ul style="list-style-type: none"> • Conducting soil testing to measure nutrient content and fertility levels. • Evaluate the test results to determine the optimal conditions for organic plant growth. • Providing fertilization recommendations based on the results of soil analysis. • Monitor changes in soil fertility over time to ensure conditions remain optimal. • Developing sustainable and environmentally friendly land management strategies. • Prepare a report on the results of soil analysis for use by farmers and agricultural managers. • Providing consultation to farmers on how to best manage their land for organic farming.
Soil Health Technician: This technician is responsible for conducting soil analysis and managing soil health in the field, primarily monitoring soil conditions and assisting in the implementation of soil improvement practices.	<ul style="list-style-type: none"> • Collect soil samples and conduct laboratory analysis. • Operate soil quality testing equipment. • Assist in soil treatment and restoration using organic materials. • Apply fertilization and irrigation techniques to improve soil health. • Monitor and document the results of soil health practices in the field. • Provide technical recommendations to field workers on soil maintenance practices. • Prepare technical reports on changes in soil quality after interventions.
Organic Soil Analyst. The Organic Soil Analyst specializes in analyzing soil samples to determine their suitability for organic farming.	<ul style="list-style-type: none"> • Collect and analyze soil samples from organic farms to assess fertility and health. • Use laboratory equipment to measure soil properties such as pH, nutrient levels, and organic matter content. • Provide recommendations for soil treatment and amendments based on analysis results. • Develop soil fertility plans tailored to specific organic farming needs. • Monitor changes in soil health over time, ensuring continuous improvement in fertility. • Prepare detailed reports on soil conditions, including data visualization and trend analysis.
Biochar Production Technician: The Biochar Production Technician assists in the technical	<ul style="list-style-type: none"> • Operate biochar production machinery and equipment. • Monitor and control the production process to ensure high-quality biochar output. • Conduct quality tests on biochar batches to assess nutrient content

aspects of biochar production, including the operation of equipment, quality control, and routine maintenance of production systems.	<p>and structure.</p> <ul style="list-style-type: none"> • Perform routine maintenance on biochar production equipment to prevent downtime. • Implement safety protocols in the production facility to prevent accidents and ensure worker safety. • Assist in scaling production processes for large-scale biochar farming operations. • Document production data, including efficiency and output metrics.
<p>Biochar Specialist Assistant: The Biochar Specialist Assistant supports senior biochar specialists in both the production and application of biochar. They assist in conducting experiments, analyzing results, and implementing biochar projects on the ground.</p>	<ul style="list-style-type: none"> • Assist in the collection and analysis of soil and biochar samples to assess quality and effectiveness. • Support biochar production specialists in the operation of equipment and monitoring production processes. • Help apply biochar to test plots or farms following specific guidelines. • Record and document data from field trials, experiments, and production processes. • Assist in research and development projects related to biochar farming and its impact on soil health. • Conduct basic tests to assess biochar quality and nutrient content. • Communicate with farmers and field workers to ensure proper biochar application methods are followed.

Table 7 highlights roles such as Organic Farm Worker and Organic Compost Handler, which focus on day-to-day tasks that ensure the smooth operation of organic farms. These positions are hands-on, requiring workers to plant, maintain, and harvest crops, as well as manage organic waste materials. The Soil Health Worker and Biochar Farm Worker roles emphasize practical skills in applying compost and biochar to improve soil health.

Table 7. Occupation map and its competence in Organic farming within IQF level 4

OCCUPATION AND ITS DESCRIPTION	COMPETENCE/TASKS
Organic Farm Worker: is a worker who performs various tasks in organic farming, including planting, maintaining, and harvesting crops.	<ul style="list-style-type: none"> • Plant seeds and seedlings according to organic farming techniques. • Watering, fertilizing, and weeding to ensure the plant grows properly. • Harvest the crop according to the correct schedule and technique. • Applying environmentally friendly pest and disease control methods. • Operating and maintaining agricultural tools and machinery.
Organic Produce Handler: is an organic produce handler that ensures organic products are processed and packaged in accordance with quality standards.	<ul style="list-style-type: none"> • Receiving crops and ensuring product quality is in accordance with standards. • Cleaning and sorting organic products based on quality. • Packaging organic products in accordance with hygiene procedures and standards. • Label product packaging with accurate and regulatory information. • Store products in appropriate places to maintain freshness and quality.
Greenhouse Technician: is a technician who manages	<ul style="list-style-type: none"> • Managing the climate system in the greenhouse to ensure optimal conditions for plants. • Monitor plant growth and health regularly.

the production of organic plants in a greenhouse environment, including climate regulation and plant health monitoring.	<ul style="list-style-type: none"> • Planting seeds and transplanting seedlings into a greenhouse. • Apply appropriate pest and disease control methods in the greenhouse environment. • Maintain and repair the irrigation, ventilation and heating systems of the greenhouse. • Record data related to temperature, humidity, and plant growth. • Regulates the provision of nutrients for greenhouse plants.
Organic farming Junior Inspector. is a novice inspector who assists in the inspection and audit of organic farm operations.	<ul style="list-style-type: none"> • Assisting senior inspectors in conducting inspections in organic farming operations. • Collect data and information related to the compliance of agricultural operations with organic standards. • Checking documents and records required for audits. • Assist in the preparation of inspection findings reports. • Monitor agricultural practices in the field to ensure compliance with regulations.
Soil Health Worker: The Soil Health Worker implements basic soil health practices in the field, especially in organic soil management and maintenance.	<ul style="list-style-type: none"> • Apply organic fertilizers and manage soil according to technical instructions. • Manage water circulation to maintain soil moisture and health. • Plant cover crops to prevent soil erosion. • Follow instructions from technicians or coordinators for soil restoration. • Manage compost and other organic materials to improve soil structure.
Organic Compost Handler: The Organic Compost Handler is responsible for managing and processing organic waste materials into compost.	<ul style="list-style-type: none"> • Collect and process organic waste materials for compost production. • Monitor compost piles, ensuring proper aeration, moisture levels, and temperature to accelerate decomposition. • Test compost for nutrient content and quality to meet organic farming standards. • Manage compost application on fields, ensuring proper distribution and integration into the soil. • Train field workers on best practices in compost handling and application.
Biochar Farm Worker: The Biochar Farm Worker supports the implementation of biochar on farms by assisting in its application to the soil and helping manage field operations related to biochar farming.	<ul style="list-style-type: none"> • Apply biochar to fields following technical guidelines provided by supervisors. • Assist in preparing the soil for biochar incorporation by tilling or mixing. • Maintain biochar storage areas to ensure safe and efficient use. • Operate simple farm machinery for biochar application. • Monitor crop response to biochar applications and report observations to supervisors. • Assist in the collection of soil and crop samples for testing after biochar use.
Biochar Technician: The Biochar Technician is responsible for the hands-on technical operation of biochar production and application equipment.	<ul style="list-style-type: none"> • Operate and maintain biochar production equipment to ensure efficient processing of biomass into biochar. • Monitor the biochar production process, adjusting parameters such as temperature and time to optimize quality. • Test the produced biochar for quality control, ensuring it meets the required standards for agricultural use. • Apply biochar to fields following the specific recommendations for crop type and soil conditions. • Assist in setting up and calibrating machinery used for biochar application in large-scale farming.

- Document production data, including output, quality, and application rates, to track performance.

Table 8 presents entry-level roles, such as Organic Farm Assistant and Junior Soil Health Assistant, which support the technical staff in carrying out specific organic farming tasks. These roles require basic knowledge of organic farming methods, such as planting, weeding, and applying compost. The Biochar Farming Assistant helps in the operational aspects of biochar application, supporting technicians and field workers in biochar-related activities.

Table 8. Occupation map and its competence in Organic farming within IQF level 3

OCCUPATION AND ITS DESCRIPTION	COMPETENCE/TASKS
Organic Farm Assistant: is an assistant who assists in a variety of specific tasks in organic farming under direct supervision.	<ul style="list-style-type: none"> • Helps in the process of planting seeds and seedlings of organic plants. • Perform maintenance tasks such as watering, weeding, and fertilizing. • Assists in the process of harvesting organic crops according to the instructions. • Assisting in the application of environmentally friendly pest and disease control methods. • Operate and maintain agricultural equipment under supervision.
An Irrigation Technician: is a technician who operates and maintains an irrigation system for organic farming.	<ul style="list-style-type: none"> • Operate an irrigation system to ensure plants get enough water. • Perform routine maintenance and repairs to the irrigation system. • Monitor soil moisture levels and adjust irrigation schedules as needed. • Installing and repairing irrigation pipes, sprinklers, and other components. • Implement water-saving techniques to improve irrigation efficiency.
Organic Greenhouse Worker: is a worker who assists in the day-to-day operation of an organic greenhouse, including planting and maintaining plants.	<ul style="list-style-type: none"> • Plant seeds and transplant plant seedlings into pots or beds in a greenhouse. • Watering, fertilizing, and weeding plants in the greenhouse. • Monitor plant conditions to detect pests, diseases, or growth problems. • Helps regulate temperature, humidity, and ventilation in the greenhouse for optimal conditions. • Apply appropriate pest and disease control methods.
Junior Soil Health Assistant: This assistant supports technicians and field workers in soil health management, especially in simple operational tasks.	<ul style="list-style-type: none"> • Assist technicians in collecting soil samples and preparing them for analysis. • Plant simple cover crops to improve soil structure. • Provide organic materials such as compost for soil application. • Operate simple equipment to improve soil conditions. • Assist in monitoring soil moisture and managing water. • Support in documenting and recording changes in soil quality. • Perform other operational tasks related to soil maintenance.
Biochar Farming Assistant: The Biochar Farming Assistant helps with operational tasks in biochar application, focusing on supporting technicians and field workers in daily biochar farming activities.	<ul style="list-style-type: none"> • Assist technicians in transporting and applying biochar to fields. • Prepare fields for biochar application by clearing and tilling. • Measure and distribute biochar according to recommended application rates. • Record basic data on biochar application and crop performance. • Maintain tools and equipment used in biochar farming. • Follow instructions from supervisors regarding safety and proper application techniques. • Help in the cleanup and organization of biochar storage and

application sites.

Table 9 outlines roles such as Organic Farm Laborer and Soil Fertility Assistant, which involve performing fundamental tasks like soil preparation, planting, and maintaining crops. These roles require a basic understanding of organic farming techniques and an ability to follow technical instructions for field operations. The Biochar Processing Laborer assists in the production and handling of biochar, ensuring its proper processing and storage. Competencies focus on physical labor, equipment operation, and maintaining clean and organized work areas. These entry-level roles are crucial for the foundational tasks that support larger organic farming operations.

Table 9. Occupation map and its competence in Organic farming within IQF level 2

OCCUPATION AND ITS DESCRIPTION	COMPETENCE/TASKS
Organic Farm Laborer: is a worker who performs basic tasks such as soil preparation, planting, and harvesting in organic farming.	<ul style="list-style-type: none"> • Preparing the soil includes plowing, loosening, and preparing planting beds. • Plant seeds and seedlings in accordance with the technical instructions provided. • Watering, weeding, and fertilizing regularly. • Harvest organic crops at the right time and in the right way. • Apply the pest control method manually or use organic pesticides. • Maintain and clean agricultural tools after use.
Packaging Assistant: is an assistant that assists in the process of packaging organic products, ensuring compliance with quality standards.	<ul style="list-style-type: none"> • Receiving and inspecting organic products to be packaged. • Packaging organic products in accordance with quality and hygiene standards. • Label products with appropriate information such as product type, harvest date, and organic certification. • Store packaged products in an appropriate place to maintain freshness. • Prepare products for delivery according to schedules and instructions. • Record and report the number of products that are packaged and ready to ship.
Nursery Assistant: is an assistant who works in organic plant nurseries, assisting in seedling preparation and care of young plants.	<ul style="list-style-type: none"> • Preparing planting media and seedlings for organic plant nurseries. • Planting seedlings into pots or nursery beds. • Watering, fertilizing, and weeding are carried out to ensure optimal seedling growth. • Monitor the health of seedlings and identify signs of disease or pests. • Applying environmentally friendly pest and disease control methods. • Moving ready seedlings to the planting area or to farmers.
Soil Fertility Assistant: This assistant helps in basic tasks such as preparing soil for quality improvement and maintaining soil fertility in organic farming.	<ul style="list-style-type: none"> • Provide organic fertilizers and other soil improvement materials. • Assist in managing irrigation to maintain soil moisture. • Prepare the land for planting organic crops. • Carry out soil treatment as instructed by technicians or supervisors. • Apply simple techniques to prevent soil degradation. • Report any changes in soil conditions to the technician or supervisor.
Biochar Processing Laborer: The Biochar Processing Laborer assists in the production	<ul style="list-style-type: none"> • Load and unload biomass materials into biochar production equipment. • Monitor the temperature and conditions of biochar kilns to ensure proper processing.

and handling of biochar at a processing facility, ensuring that biochar is prepared and transported efficiently for agricultural use.	<ul style="list-style-type: none"> • Perform manual tasks such as bagging, labeling, and storing biochar. • Transport biochar from production sites to storage or distribution points. • Assist in maintaining clean and organized production facilities. • Help in quality control checks by preparing samples for testing.
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Table 10 covers the most basic roles, including General Farm Worker and Organic Compost Assistant, which involve simple tasks such as planting, watering, and applying compost. The Biochar Handling Laborer plays a similar role, handling biochar materials and assisting in their transport and application on farms.

Table 10. Occupation map and its competence in Organic farming within IQF level 1

OCCUPATION AND ITS DESCRIPTION	COMPETENCE/TASKS
General Farm Worker: is a general worker who performs routine and simple tasks on an organic farm under strict supervision.	<ul style="list-style-type: none"> • Assist in land preparation including clearing the area and preparing planting beds. • Plant seeds and seedlings according to the instructions of the supervisor. • Watering, fertilizing, and weeding regularly. • Harvest the crop according to the set schedule and method. • Using simple methods to control pests and plant diseases.
Organic Compost Assistant: is an assistant that assists in the preparation and management of organic compost.	<ul style="list-style-type: none"> • Collect organic matter such as plant residues and kitchen waste to be composted. • Assists in the compost processing process including mixing and monitoring. • Ensure that the compost pile is maintained humidity and temperature according to needs. • Monitor the decomposition process and ensure there is no contamination. • Apply mature compost to agricultural land according to the instructions.
Field Hand: is a field worker who performs basic work such as planting, weeding, and harvesting on organic farms.	<ul style="list-style-type: none"> • Planting seeds and seedlings on agricultural land. • Weeding weeds that interfere with plant growth. • Assists in the process of harvesting crop products. • Carry out pest and disease control with the recommended methods. • Assists in the maintenance and cleanliness of agricultural land. • Record and report daily activities and plant conditions to supervisors.
Soil Preparation Laborer: The Soil Preparation Laborer performs basic tasks related to soil preparation and maintenance under the instructions of the technical team.	<ul style="list-style-type: none"> • Manually prepare soil according to technical guidelines. • Collect and apply organic materials such as compost. • Provide basic operational support for maintaining soil conditions. • Assist with general tasks related to planting and land maintenance. • Help manage drainage systems to balance water levels in the soil.
Biochar Handling Laborer: The Biochar Handling Laborer performs basic tasks	<ul style="list-style-type: none"> • Handle biochar bags or containers for transport and storage. • Assist in the loading and unloading of biochar at various locations. • Maintain cleanliness in biochar storage areas to prevent contamination.

related to the physical handling, storage, and movement of biochar on the farm or in the production facility.	<ul style="list-style-type: none">• Provide support to field teams by delivering biochar to application sites.• Operate simple tools for mixing or spreading biochar.
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1. Develop a Model for Aligning Educational Learning Outcomes with Organic Farming Industry Needs:

The model for aligning educational learning outcomes with the needs of the organic farming industry represents a comprehensive framework designed to bridge the gap between education and industry demands. By integrating key elements such as occupation mapping, competency-based recruitment, curriculum design, and certification schemes, the model ensures that educational programs produce graduates equipped with the specific skills and competencies required at various levels of responsibility in the organic farming sector. This alignment provides a structured pathway for career progression, from entry-level roles to advanced leadership positions, supporting workforce readiness and sustainable agricultural development.

Table 11. The Model of Interface for Aligning Educational Learning Outcomes with Organic Farming Industry Needs, Certification Scheme, and National Dictionary of Occupation.

KBJI/ Indonesian - ISCO	National Dictionary of Occupation	OCCUPATION MAP – ORGANIC FARMING	COMPETENCY- BASED RECRUITMENT VACANCIES	"SKILL SETS" OPERATIONAL CURRICULUM	COMPETENCY CERTIFICATION SCHEME
• KBJI/ISCO Code	• KBJI/ISCO Code	• KBJI/ISCO Code	• KBJI/ISCO Code	• KBJI/ISCO Code	• KBJI/ ISCO Code
• Title of Position (occupation, profession)	• Job Title	• Job title	• Vacancy	• Title of vocational package and Learning Outcomes.	• Title of occupation scheme
• Description	• Description	• Job description	• Job discription	• Definition/Scope of learning	• Description
-	-	• Field of work	• Scope of Work	• Workplace context	• Scope of use
-	• Temperament	• Employability skills/ soft skills	• Accountability	• Managerial and cultural competencies	• Employability skills
-	-	• Responsibility	• Responsibility	• Job role responsibilities	• Responsibility
-	• Job Requirements	• Basic requirements	• Basic requirements	• Entry behavior line	• Basic requirements
-	-	• Experience achievements	• Work experience	• Level/degree of Achievement Criteria	• Experience level
• Task	• Task Details	• Tasks and competency standards	• Tasks	• Basic competencies and expertise	• Occupational packaging
-	-	-	• Benefit	-	-
-	-	-	• Working Relations	-	-
-	-	-	-	-	• Certification process

CONCLUSION

This study highlights the crucial need to align organic farming occupations with educational frameworks to bridge competency gaps and address generational challenges in Indonesia's agricultural sector. By systematically mapping organic farming roles within the Indonesian Qualification Framework (IQF), the research identifies key competencies across all levels, from entry-level workers to advanced specialists. A comprehensive interface model was developed to connect occupational maps with job descriptions, curricula, competency-based recruitment, and potential certification schemes, offering practical insights for curriculum design and workforce development. The study recommends curriculum enhancements that incorporate advanced agricultural technologies, strengthen hands-on training, and establish clear career pathways to attract young people to organic farming. Additionally, a strategic

framework is proposed to modernize the perception of farming by integrating innovative educational approaches, supporting youth entrepreneurship, and leveraging digital platforms to engage the younger generation. By addressing these gaps, this research provides a roadmap for aligning education with industry demands, fostering youth interest in organic agriculture, and developing a skilled workforce to drive sustainable agricultural growth, ultimately strengthening Indonesia's agricultural sector and ensuring its long-term viability.

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