Journal of Industrial Engineering & Management Research
http://www.jiemar.org e-ISSN : 2722-8878
Vol. 7 No. 4 – 2026

Implementation and Mechanism of Organic Product Certification Using the Multi-Criteria Decision-Making Method in Banyuwangi City

Agus Hari Hadi[#1], Suwandi[*2], Nurman Yakin[#3], Muhammad Arief[#4], Rachmat[#5]

[#]*Industrial Engineering & Technical Faculty & University of Yuppentek Indonesia*

[1]agusharihadi@gmail.com
[2] suwandizy2018@gmail.com
[3] nurmanyakin906@gmail.com
[4] ariefjdsk659@gmail.com
[5] pukulunadiguru@gmail.com

Abstract *— Organic products are defined as those free from harmful chemical pesticides; in short, they are products resulting from processes that are largely natural. Farmers in Banyuwangi must adhere to procedures established by the local government to sell their agricultural produce; specifically, marketing their products requires obtaining certification based on criteria set by an organic certification body. To identify which criteria should be prioritized and are most relevant to organic products, the study employs the Analytic Hierarchy Process (AHP), multi-criteria analysis, and sensitivity analysis. The analysis concludes that the key priorities to consider are cost, market access, and producer availability, while the "Person in Charge" (PIC) stands out as the alternative most likely to be prioritized..*

Keywords *— Analytic Hierarchy Process (AHP), Multi-Criteria Method, Sensitivity Analysis*

I. INTRODUCTION

Growing consumer awareness regarding health and the desire to consume food free from chemical ingredients have driven an increasingly strong demand for organic products. A 1998 survey conducted in Europe revealed that 94% of respondents purchased organic products because they were deeply concerned about their own health and that of their families (Eureka Indonesia Foundation website, 2009). Ririen Prihandarini, Secretary General of the Indonesian Organic Agriculture Society (Maporina), noted that people worldwide are beginning to focus on organic food products (Falik Rusdayanto, 2009). Organic food can be defined as food produced without chemical fertilizers or pesticides (Prof. Dr. F.G. Winarno, cited by the Kuliner Indonesia website, 2011). Furthermore, Bernard Pradsojo stated that organic food is the purest form of food, grown or produced without the aid of chemical substances. Made Astawan, cited by the Bumi Ganesa website (2011), described organic food as any food product grown with minimal or absolutely no chemical elements (such as fertilizers, pesticides, hormones, or drugs). Ririn Syafriani (2007) cited Dr. Angela C. Ardhanie—an organic therapy specialist at Healthy Choice Kemang—defining organic products as food items produced without the use of chemicals or hazardous substances during cultivation and processing. Examples include organic rice and vegetables, which are grown without the use of pesticides or chemical fertilizers (Segar Organic website, 2007). Agung Prawoto and Lasti Kurnia explained that organic food is produce derived from organic farming systems designed and managed to ensure sustainable productivity (Amir Amirulloh Blog, 2009). Organic food encompasses fresh, semi-processed, and finished food products; from the cultivation of raw materials through processing and distribution, each stage complies with the standards of the Codex Alimentarius Commission (CAC) and IFOAM (International Federation of Organic Agriculture Movements). The CAC is an organization established by the WHO and FAO, and it is the sole body regulating global food trade and food standards (Eureka Indonesia Foundation website, 2009). Agung Prowoto and Lasti Kurnia, as cited by Amir Amirulluh on his blog (2009), also note that consumer demand for organic food continues to rise. The global market share for organic products is projected to reach approximately US$100 billion over the next decade (Eureka Indonesia Foundation website, 2009). The United States and Germany are the countries with the highest levels of organic food consumption (Anonymous, April 25, 2011). The organic food market in the United States (US) has grown by approximately 20% annually since 1990 (Indonesian Organic Agriculture Guarantee Institute, 2006). *The

World of Organic Agriculture 2011* reports that the largest domestic organic food market in 2009 was the United States, valued at €17.835 billion, followed by Germany (€5.800 billion) and France (€3.041 billion). The other seven countries in the top 10 organic food markets were the United Kingdom (€2.065 billion), Italy (€1.500 billion), Canada (€1.284 billion), Switzerland (€1.023 billion), Japan (€1.000 billion), Spain (€0.905 billion), and Austria (€0.868 billion). While developed nations remain the primary markets for organic products from developing Asian countries, domestic markets in the latter are also beginning to strengthen, albeit from a relatively small base. In Oceania, including Australia and New Zealand, strong growth in organic food production is heavily driven by export demand, although the domestic market is also growing.

II. LITERATURE

A decision support system is an interactive, computer-aided system that facilitates user access to data and decision models to assist in effective decision-making for solving semi-structured and unstructured problems; therefore, it must be capable of the following (Daihani, 2001):

1. Being expanded or developed
2. Supporting data analysis and decision modeling
3. Being future-oriented
4. Being used on an unscheduled basis

A decision support system (DSS) is an interactive information system that provides information, modeling capabilities, and data manipulation. This system is used to assist decision-making in semi-structured and unstructured situations (Kusrini, 2007). Based on the definitions above, it can be concluded that a Decision Support System (DSS) is a computer-based information system that employs an approach to generate various decision alternatives, helping specific parties address problems through the use of data and models. A DSS merely provides decision alternatives, leaving the final decision to the user. Decision-making is the outcome of a selection process involving various potential courses of action—chosen via specific mechanisms—aimed at producing the best possible decision. A decision process that is gradual, systematic, and consistent, and which involves all relevant parties at every stage from the outset, will yield positive results.

The Analytical Hierarchy Process (AHP) method was developed in the early 1970s by Dr. Thomas L. Saaty, a mathematician from the University of Pittsburgh. AHP is fundamentally designed to rationally capture the perceptions of individuals closely associated with a specific problem, utilizing a procedure intended to establish a preference scale across various sets of alternatives. This analysis aims to model unstructured problems—typically those requiring judgment or involving complex, ill-defined situations where statistical data is scarce or nonexistent, relying instead on qualitative factors such as perception, experience, or intuition. Decision Support Systems (DSS) aim to provide information, guidance, and predictions, directing users toward better decision-making. Several multivariate decision-making and optimization techniques are employed in policy analysis. Fundamentally, the Analytic Hierarchy Process (AHP) is a comprehensive decision-making model that accounts for both qualitative and quantitative factors. The AHP decision-making model essentially seeks to address the shortcomings of previous models. It allows for the structuring of a system and its environment into interacting components, subsequently integrating them by measuring and managing their impacts within the system (Saaty, 2001). The advantages of using AHP for problem-solving and decision-making include (Saaty, 1993):

1. AHP provides a single, easily understandable, and flexible model for a wide range of unstructured problems.
2. AHP integrates deductive and systems-based approaches to solve complex problems.
3. AHP can handle the interdependence of elements within a system without imposing linear thinking.
4. AHP reflects the mind's natural tendency to sort system elements into different levels and group similar items within each level.
5. AHP provides a scale for measurement and establishes a method for setting priorities.
6. AHP tracks logical consistency and the reasoning applied when establishing priorities.
7. AHP leads to a comprehensive assessment of the quality of alternative systems. 8. AHP considers the relative priorities of various system factors and enables organizations to select the best alternative based on their objectives.
9. AHP does not force a consensus but synthesizes a result that represents the various judgments.
10. AHP allows organizations to refine their definition of a problem and improve their judgment and understanding through iteration.

The working principle of AHP involves simplifying a complex problem that is unstructured, strategic, and dynamic.

Journal of Industrial Engineering & Management Research
http://www.jiemar.org e-ISSN : 2722-8878
Vol. 7 No. 4 – 2026

III. RESEARCH AND ELABORATION METHODOLOGY

This study utilizes primary data obtained through Focus Group Discussions (FGDs) and direct interviews—using questionnaires—with the Agriculture Agency, two farmer groups, individual farmers, and consumers; secondary data was obtained from the Industry Agency. A sample of 40 respondents was selected, and data collection also involved in-depth interviews—guided by a structured interview protocol—conducted with key informants knowledgeable about the mechanisms surrounding organic products. The variables measured and analyzed include internal factors (strengths such as farmer resources, technology, and production inputs; weaknesses such as marketing and land issues), opportunities (government, social, and economic factors), and threats (such as competition). Data analysis employed the Multi-Criteria Decision Making (MCDM) method; by establishing a systematic decision structure and applying a series of calculation procedures, the study generated priority recommendations or decision weights for each proposed alternative. The process involves several straightforward steps: structuring the decision problem, performing pairwise comparisons, synthesizing priorities (weights), and conducting consistency checks. Subsequently, each alternative is evaluated based on how well it meets the established criteria. This method facilitates the determination of criterion priorities and alternative priorities for specific criteria, ultimately resulting in a synthesized priority ranking for all alternatives based on the complete set of established criteria. Pairwise analysis serves as the initial step in determining priorities (weights). The scoring scale ranges from 1 (indicating that two aspects, factors, or items are of equal importance) to 9 (indicating that one is absolutely more important or dominant than the other), including their reciprocal values.

Input – Output System Model

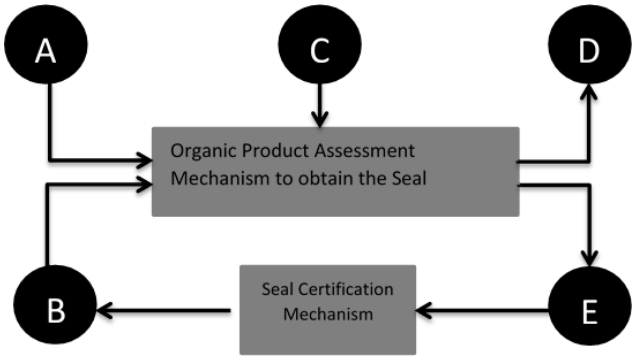
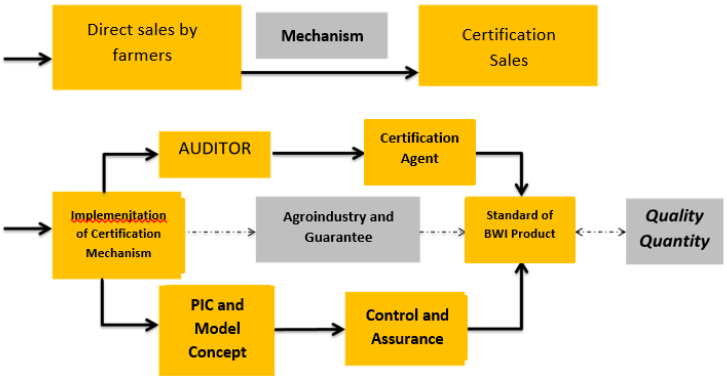


Figure 1. Certification Mechanism Input-Output System

The model above illustrates the input-output system involved in establishing the organic product mechanism, comprising: A inputs—organic products, environmental sustainability, organic farmers, meeting needs, appropriate use of chemical inputs, and implementation of good crop cultivation systems; B inputs—quality products, meeting the needs of farmers/producers and consumers/markets, ecosystem and environmental conservation, reduced use of toxic substances, and use of organic fertilizer and pesticide systems; C environmental inputs—natural resource conservation, sustainable land, soil, and water use, sustainable consumption, and ISO 14001 and SA8000 certifications; D desired outputs—products compliant with certification assessment mechanisms and product certification labels, and guaranteed crop quality; E undesired outputs—low-quality products, products failing to meet consumer needs, and ecosystem/environmental damage due to the use of toxic substances.

Flow diagram of the control mechanism for organic product quality assurance



Journal of Industrial Engineering & Management Research
http://www.jiemar.org e-ISSN : 2722-8878
Vol. 7 No. 4 – 2026

Figure 2. Organic Product Flow Diagram

The above picture illustrates the stages of the certification process, which involves two distinct pathways: the first utilizes auditors selected by a certification body, while the second employs a designated person-in-charge (PIC) or salesperson operating under a control and assurance system. Both mechanisms aim to ensure compliance with organic product standards in Banyuwangi City. Their implementation is expected to foster a certified agro-industry that prioritizes sustainable quality and quantity to meet market demands. Key operational activities within this agro-industry to meet organic standards include sorting vegetables according to specifications, properly packaging fresh produce, ensuring a diverse vegetable assortment that matches the application display, creating sample packaging displays showcasing product varieties, setting competitive prices, and providing excellent service.

AHP Hierarchical Structure

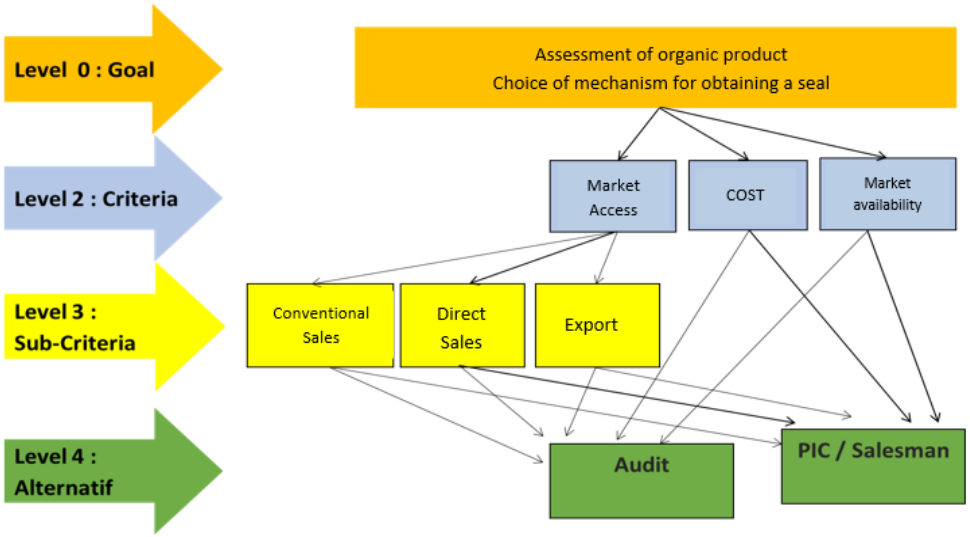


Figure 3. Hierarchy Structure of AHP

The above picture illustrates that a farmer intending to market their produce must navigate a process involving criteria, sub-criteria, and alternatives; this represents a pathway of choices aimed at achieving the quality and quantity of organic produce required to obtain certification. Following processing and analysis, the results obtained are as shown in the table below:

Goal			
Certification Agent			
Criteria	Market Access	Cost	Market Availability
	0,25992	0,32748	0,41261
Sub-Criteria	Conventional Sales	Direct Sales	Eksport
	0,19580	0,31081	0,49339
Alternative		Auditor	PIC/Salesman
	1_B	0,33333	0,66667
	2_K	0,33333	0,66667
	3_PK	0,25000	0,75000
	4_PL	0,80000	0,20000
	3_E	0,25000	0,80000

Journal of Industrial Engineering & Management Research
http://www.jiemar.org e-ISSN : 2722-8878
Vol. 7 No. 4 – 2026

IV. RESULT AND CONCLUSION

Based on the discussion above, the prioritized order is as follows: for criteria-market availability, cost, and market access; for sub-criteria-exports, direct sales, and conventional sales; and for the alternative-utilizing a PIC (Person in Charge) or salesperson.

REFERENCES

[1] https://doi.org/10.1080/00207233.2019.1594216.

[2] www.elsevier.com/locate/resconrec Towards a green world: How do green technology innovations affect totalfactor carbon productivity.

[3] www.elsevier.com/locate/enpol Enablers of sustainable supply chain management and its effect on competitive advantage in the Colombian context.

[4] http://www.informaworld.com/smpp/title~content=t713435362.

[5] http://dx.doi.org/10.1080/13675560902736537.

[6] https://www.researchgate.net/publication/279525839/

[7] International Journal of Logistics Research and Applications

[8] *http://kesehatan.kompas.com/read/2009/12/17/13270290/*.

[9] http://www.dimonim.com/michael-sampoerna/pangan-organik-masa-depan-bisnisagriculture/

[10] http://amiere.multiply.com/reviews/item/82

[11] http://newspaper.pikiran-rakyat.com/prprint.php

[12] http://bumiganesa.com/?p=307

[13] http://www.greenradio.fm/news/latest/5573-hidup-sehat-konsumsi-makanan-organik

[14] http://panganpertanianorganik.blogspot.com