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STRATEGY FOR IMPROVING FOOD SAFETY COMPLIANCE IN BOTTLED DRINKING WATER PRODUCTION FACILITIES (CASE STUDY: PROVINCIAL OFFICE OF INDONESIAN FDA IN KUPANG)

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Abstract: Water is an essential need for human survival. However, access to safe drinking water remains a global challenge, particularly in East Nusa Tenggara (NTT) province. This condition makes the bottled drinking water (AMDK) industry increasingly in demand because the need for drinking water continues to rise along with population growth. Apart from being widely consumed by the public, AMDK can be contaminated due to changes in environmental conditions. Therefore, the government monitors these products strictly to protect public health while at the same time encouraging product competitiveness. One of the Provincial Office of Indonesian FDA Kupang scopes of tasks in the food control function is post-market vigilance. Food safety inspections of AMDK production facilities in NTT showed low compliance with the Good Processed Food Manufacturing Practices (GMPs) standards. This study aims to develop the best alternative strategy to improve food business operators (FBOs) compliance with food safety regulations. The combination of Value-Focused Thinking (VFT) and Analytic Hierarchy Process (AHP) methods is used for the decision-making process. The VFT method is used to determine the criteria and sub-criteria of the selection process and make alternative strategies to achieve the organization's values and goals. Based on an assessment by AHP analysis, the first priority strategy for improving compliance in food safety is education with a weight value of 0.462, followed by engagement (0.251), enforcement (0.185), and incentive (0.102).

Keywords: *AHP, VFT, food inspection, food business operator, compliance*

1. Introduction

The food and beverage industry has the highest contribution in the non-oil and gas processing industry sector. The main factor driving the growth of the food and beverage industry is a size-able domestic market supported by an abundance of natural resources (Ministry of Industry, 2021). In Indonesia, there are 4 (four) types of bottled drinking water: Natural Mineral Water, Mineral Water, Demineralized Water, and Dew Drinking Water. Their standards have been regulated in Indonesian National Standard (SNI). Based on product data registered with the Indonesian FDA, around 7,780 bottled drinking water products have 1,032 manufacturers throughout Indonesia. Of all bottled drinking water products, 99.5% are domestic products (BPOM, 2020).

Food manufacturing inspections aimed to ensure food business operators (FBOs) comply with applicable regulations and implement Good Manufacturing Practices (GMPs) in processed food to assure product quality and safety. Bottled drinking water (AMDK) is the mainstay of food industries with BPOM MD permits in East Nusa Tenggara (NTT). Table 1 shows the result of AMDK manufacturing inspections from 2018-2020. More than half of AMDK production facilities was declared as non-conformity to the GMPs standards. Failure to ensure compliance with regulations and standards will lead not only to economic losses but also to a loss of confidence in business and assurances provided by government authorities. AMDK production facilities in this research is limited in the working area of Provincial Office of Indonesian FDA in Kupang. The main scope of this study is to generate the best alternative strategy to improve the compliance of AMDK production facilities with food safety regulations.

Table 1. Inspection results of AMDK production facilities from 2018 to 2020

Year	Number of AMDK production facilities inspected	Inspection result		Non-conform category	Rating
		Conform (Rating A&B)	Non-conform (Rating C&D)		
2018	18	6 (33%)	12 (67%)	minor = 100 major = 164 serious = 119 critical = 17	A = 2 B = 4 C = 3 D = 9
2019	17	5 (30%)	12 (70%)	minor = 54 major = 119 serious = 71 critical = 9	B = 5 C = 3 D = 9
2020	19	9 (47%)	10 (53%)	minor = 28 major = 82 serious = 54 critical = 5	A = 2 B = 7 C = 6 D = 4

The monitoring & inspection program is an activity to ensure that food business operators (FBOs) comply with food safety standards and regulations. According to WHO (2018), food safety regulatory authorities are tasked with safeguarding consumers' interests by ensuring the food they eat meets relevant standards. Sound food safety policies and programs must identify food safety issues of most significant concern and implement appropriate control measures. The food inspection system consists of production and distribution facilities, sampling, analysis, and regulation follow-up inspections. The inspection result helps determine if the food processing unit complies with Good Manufacturing Practices (GMPs) in food production, storage, processing facility, and control. It is to provide input, direction and guidance for the FBO to make corrections and improve the conditions concerning rules and regulations, including those related to conditions for product registration. The inspection also ensures that the industry complies with food quality and safety regulations to reduce the risk to consumers of consuming substandard products (Barnes et al., 2022).

The literature indicates that cost, time constraints and motivations can be barriers to compliance for smaller FBOs. These factors may be exacerbated by perceptions that compliance is burdensome or an unfair inspection system. Poor regulatory compliance and low perceptions of the importance of food safety concerning other business priorities

characterize a negative safety culture (Yapp and Fairman, 2006). The implementation of the Food Quality Management System (FQMS) in small and medium industries of bottled drinking water still needs to be improved. The study showed that 35 % of enterprises fully implemented FQMS, with large-scale industries accounting for 83.33 % of the total (Mahardini et al., 2020). There is consensus in the literature that enforcement strategies should be responsive to the prevailing culture within food business operators (FBOs). Typologies that categorize FBOs based on their behaviours and attitudes have the potential to help analyze food safety culture and drive enforcement efforts. Food inspectors' responsibilities include providing advice and instruction, and enforcing laws is only one aspect of their job (Wright et al., 2012).

Food safety is an essential component in achieving Sustainable Development Goals. Safer food contributes to the prevention of foodborne illness, which leads to increased productivity and improved livelihood. Consistent food safety and high food quality are vital factors for every food business's success. Governments should prioritize food safety as a public health concern. They play a pivotal role in developing policies and regulatory frameworks. Regulators, FBOs and consumers all have responsibility for adopting best practices for food safety hazard control (WHO, 2018).

2. Research Method

This research uses a qualitative methodology that combines Value-Focused Thinking (VFT) with the Analytic Hierarchy Process (AHP) method. The VFT analysis approach narrows down the alternatives as to the premise for further analysis prior to factors affecting the implementation of GMPs in the AMDK production facilities by determining mean-end objectives. After that, the Analytic Hierarchy Process (AHP) is used to select the best strategy for the research. Qualitative data were collected through primary and secondary sources. Primary data was collected through interviews with food business operators (FBOs) and focus group discussions with food inspectors. In comparison, secondary data is in the form of materials compiled from various sources, including the literature review from recent scientific publications and results of the food inspection.

3. Results and Discussion

A. Problem Tree Analysis

Problem Tree Analysis is used to identify core problems and manage cause and effect. As shown in Figure 1, the root causes of low regulatory compliance include internal (food inspectors) and external (FBO) factors. External factors are caused by the people aspect, namely the lack of input from expertise (technical knowledge) and employees' limited education/training. Meanwhile, internal factors are related to technical regulations, including the implementation of risk-based inspection is not optimal.

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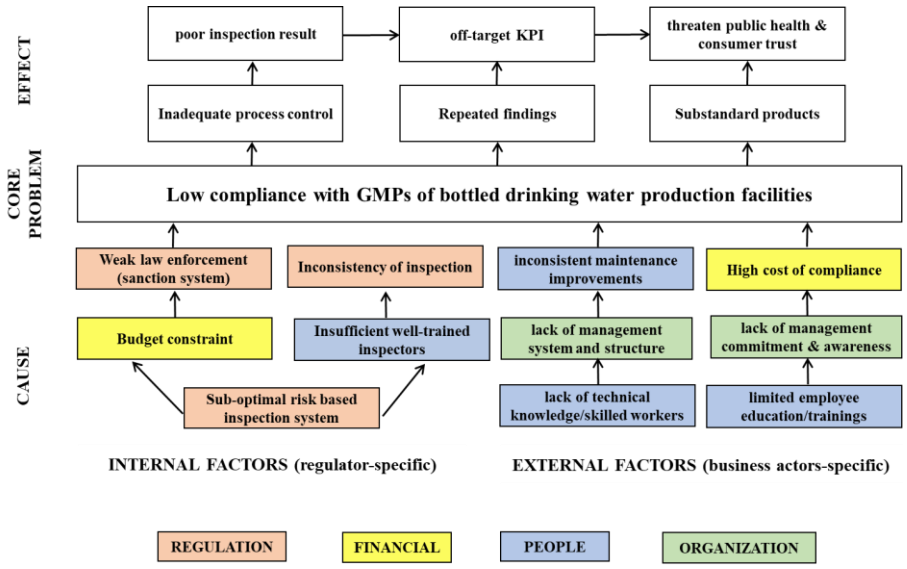

Figure 1. Problem tree analysis of low compliance with regulatory standards at AMDK production facilities

B. Value-Focused Thinking (VFT)

The VFT is a decision framing concept presented by Keeney (2008), who points out that values are used for evaluation and should reflect the decision maker's objectives. Figure 2 shows the VFT process for generating decisions criteria and alternatives. There are means and fundamental objectives that become value-driven.

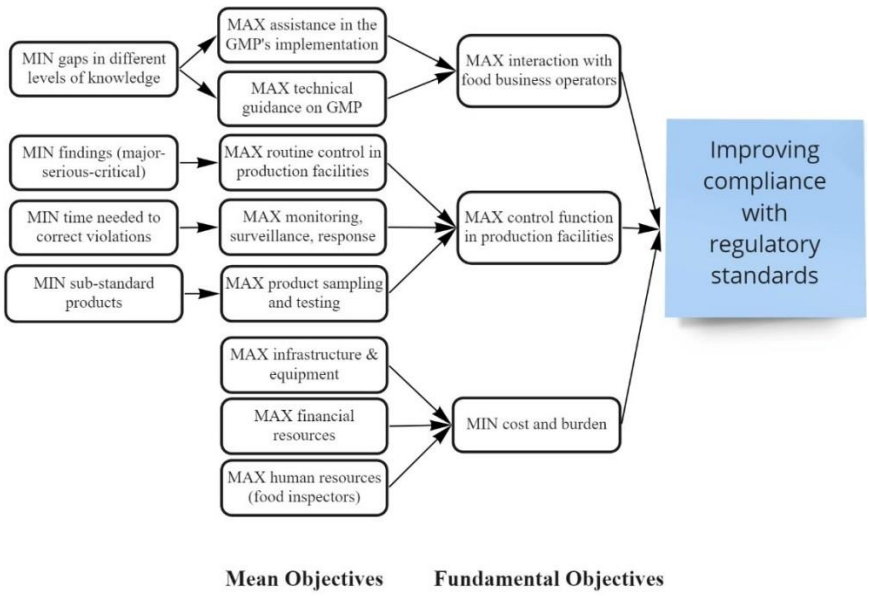

Figure 2. Value-Focused Thinking (VFT) process for developing means-fundamental objectives network

After problems are identified and the values to consider in the evaluation are specified, it can be used as values-driven to generate relevant alternatives to achieve the values. FBOs profiling is a good starting point for establishing a monitoring system and predicting which

systems may require future support in a food safety inspection. Table 2 summarizes the classification of FBO categories based on a traffic light system that is simple enough to reflect the emerging FBO profiles.

Table 2. Traffic light system for FBOs profiling

Traffic light system	Bukowski et al (2012) FSA report on FBO "Mindset"	Track Record of Previous Inspection Results	Food Safety Management System Knowledge
Green	Proactive: FBOs who displayed both the will to comply and clear ownership of food safety issues.	Rating A or B	Show good knowledge/training on food safety practices and there is a documented food safety management system
Yellow	Reactive: FBOs are taking some positive steps towards ownership of food safety issues and compliance while still relying on regulators for guidance to move them in the right direction.	Rating C	Show good knowledge/training on food safety practices but no documented food safety management system
	Passive: FBOs show a bare minimum of compliance by not taking their own initiative or showing real commitment to improve	Rating D or never been inspected before	
Red	Disinterested: FBOs who show deliberate non-compliance and unlikely to take much interest on any food hygiene rating scheme	There are cases related to food safety or the results of product supervision in circulation Not Qualifying	Show little or no knowledge/training of food safety practices

Based on the VFT that has been developed during focused group discussion, it was generated four alternatives to solve the problem as follows:

1. **Education**: Transfer of knowledge and provide a source of guidance. The strategy is aimed at targeting all FBOs (green-yellow-red zones)
2. **Engagement**: Construct collaboration relationship to improve food safety by providing channels to conduct assistance and share information to be more understandable and accessible for all FBOs (green-yellow-red zones)
3. **Enforcement**: This strategy focuses on the yellow and red zones to target low compliance at which formal enforcement action is needed.
4. **Incentive**: Utilizing rewards to promote and motivate voluntary compliance, focused on the green zone.

C. Analytical Hierarchy Process (AHP)

In the decision making, the most important and relevant criteria which influence the decision analysis must be selected for determining the best alternative. According to the results above and gather the feedback of categorization from FGD's participants, the author defines the criteria and sub-criteria of decision making that will be used in AHP for selection process. The selection criterions are:

1. Resources capacity (sub-criteria: budget allocation, food inspector availability, and infrastructure support)
2. Interaction with FBOs (sub-criteria: assistance and technical guidance outreach)
3. Control function (sub-criteria: production facilities meet requirements, followed-up CAPA, and product meet requirements)

Figure 3 describes the hierarchy framework for decision analysis on alternative strategies to improve compliance with the AMDK production facilities inspection process.

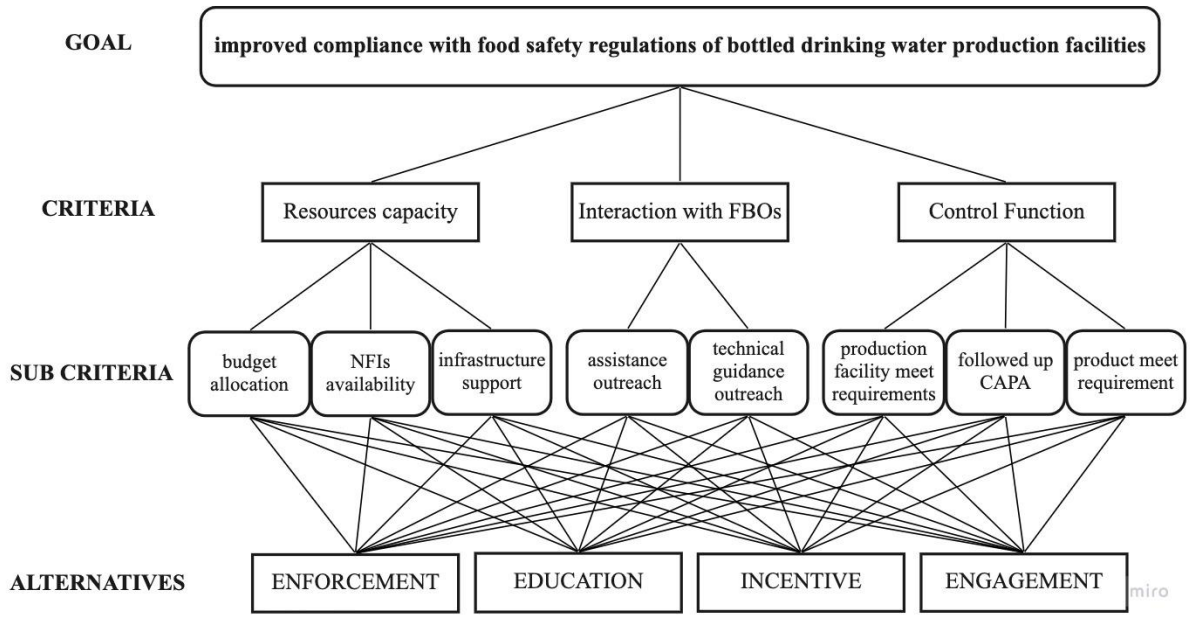

Figure 3. The Hierarchy framework for Decision Analysis

AHP was used to select strategic priorities because of its high flexibility, ability to accommodate the complexity of current problems and ability to accommodate expert differences of opinion. The author uses AHP Calculator tools developed by Klaus D Goepel (2013) to generate, process, and determine the weight of defined criteria. There are six respondents whose questionnaires have been processed into a combined weighting calculation for each criterion and a combined weighting calculation using the geometric mean of respondent questionnaire answers. Tables 3 and 4 show a summary of criteria, sub-criteria and alternatives weight.

Table 3. Combined weighted calculation for Criteria and Sub-criteria

Criteria	Local weight	Sub-criteria	Local weight	Global weight
Resources capacity	0,365	Budget allocation	0,465	0,170
		NFI's availability	0,289	0,105
		Infrastructure support	0,247	0,090
Interaction with FBOs	0,382	Assistance outreach	0,182	0,069
		Technical guidance outreach	0,818	0,313
Control function	0,253	Production facility meet requirements	0,589	0,149
		Followed-up CAPA	0,287	0,073
		Product meet requirements	0,124	0,031

Table 4. Combined weighted calculation for Alternatives respect to Sub-criteria

Alternatives	Strategies to improve compliance with food safety regulation of AMDK production facilities								Aggregate Weighted (Global Weight)	
	Resources capacity			Interaction with FBOs		Control function				
	Budget allocation	NFI's availability	Infrastructure support	Assistance outreach	Technical guidance outreach	Production facility meet requirements	Followed-up CAPA	Product meet requirement		
Enforcement	0,156	0,285	0,239	0,077	0,082	0,381	0,110	0,371	**0,185**	[3]
Education	0,519	0,390	0,281	0,507	0,586	0,313	0,437	0,338	**0,462**	[1]
Incentives	0,109	0,078	0,094	0,136	0,091	0,117	0,115	0,102	**0,102**	[4]
Engagement	0,216	0,248	0,386	0,280	0,242	0,189	0,338	0,188	**0,251**	[2]
CR	0,022	0,025	0,013	0,016	0,007	0,045	0,011	0,012		

The results of the regulator's perspective to improve compliance with food safety regulation of AMDK production facilities show that the Interaction with FBOs is the most important criterion, with a priority weight of 0,382. Followed by the Resource capacity with a priority weight of 0,365, the Control function has the lowest priority weight of 0,253. While four alternative priority order shows that the education strategies have the highest score with a priority weight of 0,462, outperforming the other three alternatives: engagement strategies with a priority weight of 0,251; enforcement strategies with a priority weight of 0,185; and the last is incentive strategies with priority weight 0,102.

Regulators are aware of the legacy of protecting public health by preventing significant incidents related to food safety issues. However, they also recognize the need for regulation so as not to overburden businesses to ensure compliance. A shift in inspection approach is needed, from simply providing a rating score to a broader definition of success in improving compliance ratings.

4. Conclusion

The fundamental objectives hierarchy in AHP was structured utilizing the qualitative parameter or criteria and data objectives from the results of the VFT analysis. There are four alternative strategies formulated to improve compliance with regulatory standards in food safety inspection: (1) Education; (2) Enforcement; (3) Engagement; and (4) Incentive. The best alternative strategy was selected using the AHP process. The priority Education strategy with a weight value of 0.462, followed by engagement (0.251), enforcement (0.185), and incentive (0.102). The consistency value ratio (CR) is 0.03; less than 0.1 meant that experts' justifications and opinions were considered logical and consistent.

Given the limited resources available, regulators face a gap between their ultimate intention to achieve compliance and the effort required to ensure compliance in the food safety inspection. Knowing how to comply is an essential first step toward compliance.

Decision-makers suggest simple and accessible training as an effective method of generating a positive food safety culture within AMDK production facilities. The education strategy aligns with the root causes of compliance problems, including people system dan risk-based inspection. People systems refers to knowledge, access to training, expectations of competency in food safety practices, and communication across people in the FBOs regarding food safety issues. Risk awareness refers to how FBOs show an understanding of risks, how to manage them, and the extent to which employees are alert to actual and potential food safety risks.

References

Barnes, J., Whiley, H., Ross, K., & Smith, J. (2022). Defining Food Safety Inspection. International Journal of Environmental Research and Public Health, 19(2), 789.

BPOM. (2020). Siaran Pers: Lindungi Kesehatan Masyarakat dengan Sinergi Pengawasan Produk Air Minum Dalam Kemasan (AMDK). Available from https://www.pom.go.id/new/view/more/pers/554/Lindungi-Kesehatan-Masyarakat-dengan-Sinergi-Pengawasan-Produk-Air-Minum-Dalam-Kemasan--AMDK-.html [Accessed: 12 January 2021]

Bukowski, Graham, Naomi Boal and Leila Tavakoli (2012) "Qualitative review of food safety regulatory decision making" Report by Ipsos MORI for the Food Standards Agency

Goepel, K. D., 2013, a new AHP excel template with multiple inputs. Source: www.bpmsg.com [Accessed on February 7, 2022]

Keeney, R. L., & McDaniels, T. L. (1992). Value-focused thinking about strategic decisions at BC Hydro. Interfaces, 22(6), 94-109.

Keeney, R. L. (2008). Applying value-focused thinking. Military Operations Research, 7-17.

Mahardini, T., Hubeis, M., & Hardjomidjojo, H. (2020). Evaluasi Penerapan Sistem Manajemen Mutu Pangan Industri Kecil Menengah Air Minum dalam Kemasan (Studi pada LSPro X). Warta Industri Hasil Pertanian, 37(2), 117-123.

Ministry of Industry. (2021). Booklet Informasi Industri edisi I. Jakarta: Kementerian Perindustrian. Available from https://kemenperin.go.id/download/26660 [Accessed on 7 January 2022]

Saaty, Thomas L. (1990). How to Make a Decision: The Analytic Hierarchy Process, European Journal of Operational Research, 48, 9-26.

Saaty, Thomas L. (2008). Decision Making with the Analytic Hierarchy Process, International Journal Services Sciences, (1), 83-98.

World Health Organization (WHO). (2018). Risk communication applied to food safety: handbook. Food & Agriculture Org.

Wright, Michael, Paul Leach and Gill Palmer (2012) "A tool to diagnose culture in Food Business Operators" Reports from Greenstreet Berman Ltd for the Food Standards Agency GSB CL2567 R1 V6 FCA

Yapp, C., & Fairman, R. (2006). Factors affecting food safety compliance within small and medium-sized enterprises: implications for regulatory and enforcement strategies. Food control, 17(1), 42-51.