

Research Article

Designing the Interventions to Mitigate the Barriers of Coordination in Handling Food Security: Insight from Central Java Province

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This study aims to identify the underlying barriers that may prevent public policy coordination among stakeholders in dealing with food security in Central Java Province and suggest recommendations to enhance the coordination. This study used primary data from a questionnaire that the six government agencies' experts filled out. These experts were asked to identify the relevance and the importance of each barrier and formulate a suitable policy recommendation. There were three data processing techniques used in this study: Content Validity Analysis, Interpretative Structural Modelling (ISM) Method, and Delphi Method. The result of the Content Validity Analysis indicated 22 valid barriers. The result of the ISM method indicated eight barriers occupied the topmost level (complicated problems, insufficient sharing of information, ambiguities and lack of clarity, gap of coordination implementations between the rules and policies with the actual practice, fewer budget allocations, different aims and priorities, lack of motivation to collaborate among stakeholders from various disciplines, and weak of infrastructure). The result of the ISM method also indicated three "very significant" barriers: inadequate human resources, the limited capability of the regional government, and lack of communication and high specialization in multisector collaboration. Then, the result of the Delphi Method indicated several recognize policies to mitigate those barriers. Moreover, related to the limitation of this study, future studies should focus on the barriers in diverse places nations or compare different regions or countries; include more experts from the various stakeholder group, and test the recognized policies in the real world.

1. Introduction

The concept of "food security" has evolved and altered since the 1974 World Food Conference. Currently, there are almost 200 different definitions of food security [1]. At the beginning of social and economic development, the concept of food security focused on securing the food supply. Later, food security focused on matching food production to demand [2]. Based on this concept, the strategy in food security often considers the supply-demand imbalance in its variety, quality, region of food product, and other aspects, which eventually inflates the cost of food storage and

transportation. Food security imbalance resulted in regional and structural food shortages, putting social stability and economic development at risk [3]. Then, related to the balanced food security, policymakers in developing countries are often challenged with the problem of rising food prices to enhance food production and safe food for low-income consumers since higher prices impose a considerable cost on this category of customers. In many developing countries, the global economic downturn in family income has recently been worsened by relatively high food expenses, leading to a rise in undernourished households [4]. Consequently, developing-country governments should use

short- and long-term policy approaches to ensure and improve food security. Finally, some factors should be included in the policy and program that affects food availability in local markets. In contrast, others affect people's access to food, and still, others affect food intake, or how many nutrients a person receives from a particular food source [5].

Food security policy and programs occupy the top priority of Indonesian national development from 2020 to 2024. In this case, the policy and program about food security were focused on three main areas, namely, availability, accessibility, and food utilization. Shortly, there were some policies and programs to ensure food security proposed by the Indonesian Government [6]. The first policy and program are social support for nine essential foods to the targeted population, listed on Integrated Social Welfare Data or local government data. The Integrated Social Welfare Data includes information on who is eligible for social assistance programs such as social welfare rice assistance, Family Welfare Card, Indonesian Conditional Cash Transfer Program, and Smart Indonesia Program. The second policy and program are the National Action Plan for Food and Nutrition 2017–2019, subsequently renamed the National Strategic Policy and Plan of Action on Food and Nutrition (RAN-PG). This policy and program were issued by the Minister for National Development Planning/Head of BAPPENAS. RAN-PG collaborates with 20 ministries and boards and three coordinating ministries under the Coordinating Ministry for Human Development and Cultural Affairs authority. It is directly responsible to the President. The five pillars of the previous RAN-PG, which ran from 2011 to 2015, were carried over into the RAN-PG, which runs from 2017 to 2019. According to the RAN-PG 2017–2019, policies and programs to accelerate nutrition improvement comprise a variety of activities targeted at achieving the following objectives: (i) improving nutrition surveillance which is vital to monitor child growth; (ii) enhancing access and quality of health and nutrition services, emphasizing the first 1,000 days of life, adolescents, brides, and pregnant women, among other populations; (iii) encouraging behavioral change in the areas of health, nutrition, sanitation, cleanliness, and parental responsibility; (iv) developing village weighing stations and early childhood education to strengthen the involvement of society in nutrition reform programs, particularly those targeting pregnant women, women of reproductive age, and children under 5 in disadvantaged and border regions; (v) increasing the effectiveness of nutrition legislation and standards in their implementation and assessment, and (vi) enhancing intersectoral cooperation in conducting nutrition-sensitive and nutrition-specific interventions, with central, provincial, and district governments' increased capacity to execute the RAN-based initiatives. Then, the third policy and program is Stunting Prevention 2018–2024. The vice president and the Coordinating Ministry for Human Development and Cultural Affairs launched this policy and program as deputy. The general purpose of this policy and program is to accelerate the reduction of stunting within existing policy and institutional frameworks. This purpose is to be achieved

through the following five particular objectives: (i) ensuring that stunting reduction is a government and community priority at all levels; (ii) increasing public awareness and encouraging community behavioral change; (iii) strengthening convergence by coordinating and consolidating central, regional, and village programs and activities; (iv) increase access to nutritious food and encourage food security; and (v) increasing monitoring and evaluation as the foundation for ensuring quality services, improved accountability, and accelerated learning.

Given that various ministries and agencies are involved, it is questionable whether the policies and programs in food security are effective and will achieve their goal. In truth, the policy and program did not have a significant effect; policy harmonization, synchronization, and policy interdependence have not occurred [7]. According to ASEAN statistics, Indonesia has the second-highest poverty rate among the ten ASEAN nations, at 51.8 percent. Then, in the EIU's Global Food Security Index (GFSI), Indonesia is ranked 62nd out of 113 nations [8]. Indonesia's food security rankings remain low compared to Southeast Asian nations such as Singapore, Malaysia, and Thailand. Indonesia came in last place among Southeast Asian nations, after Singapore (first), Malaysia (second), Thailand (fifth), and Vietnam (fifth) (ranked 54). Indonesia's food security score of 55.2 places it fifth in Southeast Asia when it comes to cost. Meanwhile, the availability score is 58.2 (ranked third). After that, Indonesia only obtained a score of 34.5 (8th place) in terms of quality and safety, but it received a score of 43.9 in terms of resilience and natural resources (9th rank). According to the Global Hunger Index (GHI) 2019, Indonesia's hunger rate is severe. With a score of 20.1 percent, Indonesia is rated 70th out of 117 Indonesian nations [9]. According to Susenas figures from 2019, the number of individuals residing in Central Java Province who were facing acute food insecurity in 2019 was 579,501, or 1.67 percent of the entire population of Central Java Province, which was 34,661,084 people. This amount also represents 9.79 percent of Indonesians experiencing severe food insecurity, at 5,921,307 people, or 0.22 percent of the country's total population.

The ineffectiveness of Indonesian food security policies and programs might be due to a lack of coordination among stakeholders. "Coordination," a concept widely used in recent years, is derived from Synergistics, created in the 1970s by Haken, a German scientist [3]. The role of coordination for food security is "at best checkered". In this case, a set of decisions is coordinated if adjustments have been made. The adverse effects of each choice for other decisions in the set are avoided, lessened, counterbalanced, or outweighed to some extent and with some frequency. In another world, coordination happens when choices taken in one program or organization are considered in other programs or organizations to minimize conflict [10]. Making excellent policy coordination is not easy since various prior studies have shown that the barrier to successful coordination is high [11–13]. As a result of this phenomenon, this research will analyze the underlying barriers that may prevent public policy coordination among stakeholders in dealing with food security and suggest recommendations to enhance the coordination. This

research should ensure an integrated policy and programmatic approach to food security and vulnerability. The research was then divided into two phases. In the first phase, conduct a literature review on the barriers to public policy coordination in dealing with food security that has been published by previous authors and identify the barriers to be verified by some experts. In the second phase, a questionnaire-based survey was delivered to the experts from policymakers and government agencies involved in food security policy planning. The primary goals of the questionnaire are to identify actual barriers and comprehend and evaluate contextual relationships and hierarchical degrees of barriers.

Furthermore, the paper is arranged in the following way to accomplish the goal. Section 2 discusses the barriers related to public policy coordination (in the general subject and the context of food security) and sheds some light on them. Section 3 describes the study methodologies and processes utilized to generate the barrier-related connection using the interpretive structural modelling (ISM) approach. Section 4 presents the ISM approach's details to the barriers related to the public policy coordination in handling the food insecurities and explores the conclusions based on the findings. Finally, in Section 5 papers, the article summarizes key results, the theoretical and managerial implications of the findings, and the study's limitations and recommendations for further research. This study will contribute to a credible and accurate resource for comparable studies and ongoing research on policy coordination to address the issue of food security.

2. Literature Review

2.1. Food Security and Its Research. There are around 200 different definitions of food security [14,15], with the following being the most often used:

Food security exists when access to sufficient, safe, and nutritious food that meets most of their dietary needs and food preferences that are needed to live a healthy life (Food and Agriculture Organization (FAO)) [16].

According to FAO, food security is multidimensional and built on four "pillars," namely, physical availability of food, economic and physical access to food, food utilization, and long-term stability of the triangle dimensions (Food and Agriculture Organization of the United Nations [17]. When "the availability of nutritionally sufficient and safe meals, or the capacity to get appropriate foods in socially acceptable ways, is restricted or unpredictable," food insecurity is present [18]. It has been acknowledged that alleviating food insecurity is critical, as reflected in the second aim of the Sustainable Development Goals (SDGs) for 2030. In the United Nations [19], several researchers have done studies about food security and health problem. Some researchers investigated the relationship between household food insecurity and malnutrition in children and women, particularly regarding health issues. Regarding health issues, household food insecurity can negatively affect food consumption in terms of quantity and quality, leading to undernourishment, particularly for women and children. Then, there is a positive relationship between family food insecurity and childhood weight [20, 21], child stunting [22, 23],

and undernutrition [24]. On the other hand, the others have discovered no connection between food insecurity and undernourishment [25–29]. The negative relationship between family food insecurity and childhood malnutrition was shown by some findings of previous studies [30–33].

Apart from food security and malnutrition research, the important thing is research related to coordination in carrying out programs to guarantee food security, both in case studies in Indonesia and outside Indonesia. This study is highly significant since food security is often seen as a wicked issue, and planning for food security needs to be coordinated at all levels of government to be effective. A *wicked issue* is defined as being complex, multidimensional, transversal, uncertain, and controversial, in the sense that it is the subject of various or even contradictory definitions and approaches that are impossible to resolve definitively, that crystallize political conflicts, and that cannot be efficiently dealt with by a monothematic and specialized agency [34]. Related to the food security and coordination problem, Nkwana [35] advocated for a coordinated approach to implementing the National Policy on Food and Nutrition Security in South Africa as the guiding framework for maximizing the synergy between government departments and civil society. Wu et al. [3] assess food security in China based on a production-consumption coordination perspective. Batch et al. [36] indicated that multisectoral collaboration has helped reduce undernutrition in Ethiopia. Matt-Moreno and López Oglesby [37] indicated that lack of coordination becomes a challenge in food safety policies and governance along a heterogeneous agri-food chain and its effects on health measures and sustainable development in Mexico. Darma et al. [38] indicated that coordination between Ministries and State Institutions is the key to successfully implementing this food policy strategy. More recently, Rasul and Neupane [39] proposed a framework to help governments coordinate the actions of diverse actors across the water, energy, and food sectors and design policies and programs that address trade-offs.

2.2. The Barriers to Public Policy Coordination. While coordination has been a problem in governance for centuries, it became a priority in the 1980s and has remained so since then [11]. According to previous authors, coordination issues are not always caused by conflict; they may occur due to various reasons, factors, or barriers, as seen in Table 1. A wicked problem, such as food security, generates unique coordination challenges that include the following characteristics: high task uncertainty, low technical interdependence, potential conflicts and power imbalances between different approaches to the same problem, the abundance and heterogeneity of both the results and the issues addressed by the research in question, and—occasionally—the issue's lack of legitimacy in comparison to other problems [40].

3. Method of Research

3.1. Respondent of the Research. According to Adler and Ziglio [53], this research considers the following "expertise" criteria for selecting an expert panel as a participant or

TABLE 1: Continued.

| No. | Barriers | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|-----|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| 22 | Coordination may take place via networks, particularly networks of career government workers. These networks do not need to be institutionalized; instead, they may emerge over time due to interactions among government officials who work together and know each other well enough to cooperate outside of official channels. Unfortunately, the opening of professional public services to outsiders as part of the new public management reforms has damaged these internal networks (BAR22) | X | | | X | | X | X | | X | | | | | | |
| 23 | Limitation authorities of the health sector or other specific sectors that correlate to food security problems (BAR23) | | | | | | | X | X | | | | | | | |
| 24 | Inadequate controlling and monitoring system of coordination within each stakeholder (BAR24) | | | | | | X | | X | | X | X | | | | |
| 25 | Infrastructure is critical for agricultural, nutrition, and health sector growth and improvement. In fragile nations, these components are weak or missing. Poor infrastructure continues to be a key impediment to growth and coordination with other sectors (BAR25) | | | | X | | | | X | X | | | | | | |
| 26 | The inability of subnational governance to facilitate decentralized ownership to regional governments (BAR26) | | | | | | | | | | X | | | | | X |
| 27 | The coordination system is intended to be used for a limited time and has not been planned as a continuous coordination system, and it has not been well-scheduled (BAR27) | | | | | | | | | | | X | | | | X |

(1) Peters [11], (2) Vel et al. [12], (3) Candraweni and Rahayu [13], (4) Zerbian and de Luis Romero [41], (5) Smith [42], (6) Sugihantono et al. [43], (7) Botero-Tovar et al. [44], (8) Khalid [45], (9) Poole et al. [46], (10) Harris et al. [47], (11) Candel [48], (12) Acosta and Haddad [49], (13) Clapp and Moseley [50], (14) Donovan and Gelli [51], and (15) Febrian and Yusran [52].

responder. The experts should have knowledge and expertise with the challenges; they should be able and eager to participate, have adequate time to participate, and have practical communication skills. Then, based on those requirements, the panel experts who are participants or respondents of this research consist of (i) Head of Fish Health and Environmental Testing Laboratory Center-Food Security Service of Central Java; (ii) representatives from Quality Analysis of Fishery Product; (iii) Food Security Junior Analyst; (iv) Staff Technical of Government and Social Culture; (v) representative from Regional Development Planning, Research, and Development Agency of Central Java; and (vi) Staff of Public Health specialized in Family Health Central Java and Sub-Head of Agriculture & Maritime.

3.2. Data Collection Procedure. This study used a primary source of data which is the results of filling out the questionnaire. There were three types of questionnaires: validation questionnaire, Interpretative Structural Modelling (ISM) questionnaire, and Delphi questionnaire. The validation and ISM questionnaire are closed-ended questions. Delphi questionnaire is of semistructured and closed-ended questions. All of the questionnaires are web-based questionnaires, and the six experts are asked to fill out the questionnaire through a Google form. Then, each questionnaire's Uniform Resource Locator (URL) is sent to six experts through WhatsApp or private e-mail.

3.3. Data Processing Technique. The data processing techniques used in this study include Content Validity Analysis, ISM Method, and Delphi Method. This study uses Content Validity Analysis to assess how well the factor correlates to or represents a barrier to public policy coordination in

handling food security problems in Central Java Province. It employs empirical methodologies to construct a content validity (CVI) index, one of various content validity assessment methods [54]. The CVI is then calculated using Item-CVI (I-CVI). Because the relevance of each factor to the barrier of public policy coordination is classified on a four-point Likert scale (1 = not relevant, 2 = somewhat relevant, 3 = relevant, and four = very relevant), the I-CVI is calculated as the number of experts who rate each factor as "relevant" or "very relevant" (a rating of 3 or 4) divided by the total number of experts. I-CVI values vary from 0 to 1; if the I-CVI value is > 0.79, the factor may be relevant; if the I-CVI value is between 0.70 and 0.79, the factor should be revised; and if the I-CVI value is below 0.70, the factor should be deleted [54]. For example, the factor with an I-CVI score of 0.80 indicated that the factor was deemed "relevant" or "extremely relevant" by four out of five experts.

The second data processing technique is the ISM method. This method is used because of the high number of factors that operate as barriers to public policy coordination; it forms a complicated structure of a systematic model of the interaction between the barriers. Warfield and Sage [55,56] described ISM as a qualitative technique in which connected factors are organized into a full systemic model. Recently, ISM is used for structuring a systematic model of the relationship between several factors in a variety of fields of study [57–67]. According to Chauhan et al. [67], the ISM method for examining the systematic structure of the interaction between the barriers to public policy coordination in food security may be summarized as follows:

- (1). Conduct a literature study to identify a significant factor as the barrier to public policy coordination in food security.

- (2). Create a questionnaire to establish a connection between the barrier pairs discovered in Step 1. In this scenario, the panel of experts serving as the research's respondents is requested to express the relationship between barriers I and "j" using four symbols. If barrier I will assist in achieving barrier j, the symbol V is used; if barrier j will assist in achieving barrier I, the symbol A is used; if barriers I and j will assist in achieving each other, the symbol X is used; and if barriers I and j are unrelated, the symbol O is used. Then, depending on the respondent's response, a Structural Self-Interaction Matrix (SSIM) may be created.
- (3). Create a reachability matrix using the SSIM data. In this stage, SSIM is changed to the initial reachability matrix by replacing the four symbols (V, A, X, or O) in SSIM with 1 or 0. The transitivity of the matrix is then validated to provide the final reachability matrix. Transitivity evaluates the logic of the barrier-to-barrier connection. For example, Barrier 1 has a connection to Barrier 2, and Barrier 2 has a connection to Barrier 3, then Barrier 1 must connect to Barrier 3.
- (4). Divide the reachability matrix into several levels (reachability, antecedent, and intersection).
- (5). Create an ISM digraph using the reachability matrix and the various levels produced in Step 4.

The Delphi Method is the final data processing technique. This method is used to obtain the most trustworthy consensus of a group of experts [68]. This study used this technique to get the most reliable consensus on an intervention to reduce the barriers to public policy coordination in dealing with food security. The Delphi Method used a mix of semistructured and closed-ended surveys to reach a consensus, and it may take multiple rounds to conclude. In the first round, the Delphi Method will employ semistructured questions to select numerous potential policies from a panel of experts. Closed-ended questions are utilized in the second and subsequent rounds based on the information from the first round. This questionnaire tries to measure the priority level of the proposed policy by scoring or ranking it on a five-point Likert scale (1 = extremely ineffective, has a significant negative impact, not reasonable to 5 = highly effective, has a substantial positive effect, very reasonable). The round of the Delphi Method will finish when consensus is reached, and Kendall's W value shows that consensus. The value of Kendall's W was obtained from processing questionnaire data with Statistical Package for the Social Sciences (SPSS) software. Kendall's W value ranges from 0 to 1. A strong consensus is defined by Kendall's W value of more than 0.7; a moderate consensus is defined by Kendall's W value of 0.5; a weak consensus is defined by Kendall's W value of less than 0.3 [69].

4. Result and Discussion

4.1. The Result of Content Validity Analysis. The result of the Content Validity Analysis can be seen in Table 2. Finally, based on the value of I-CVI, this study used 22 factors as a barrier to coordination for food security in Central Java or excluded five factors as a barrier, i.e., BAR2, BAR6, BAR18, BAR23, and BAR27.

The new list of barriers of coordination for food security in Central Java, the final symbol used for the following data processing, was as follows:

- (1) Food resolution of food security issues is not in the hands of a single player and will not be resolved by owns or sector actors. It is such a complicated issue (B1).
- (2) Lack of communication and specialization in multisector collaboration makes it more vulnerable and challenging to be on the same page due to different disciplines and mandates, guiding principles, visions, and interests (B2).
- (3) Insufficient sharing of information because many organizations perform to horde information (B3).
- (4) Ambiguities and lack of clarity surrounding authority over setting policy directions and making decisions in a (legal-) normative manner (B4).
- (5) The gap of coordination implementations between the rules and policies with the actual practice (B5).
- (6) Fewer budget allocations for food security problems (B6).
- (7) Different aims and priorities among multiple sectors and actors from different disciplines (sometimes, in another sector, they have not prioritized food security as their problem) (B7).
- (8) Inadequate human resources with the competency and specific understanding of food security (B8).
- (9) Limited the capability of regional government to handle the problem (B9).
- (10) Lack of management commitment at the government level (B10).
- (11) Lack of the leader's role in giving guidance and working fast to deal with the situation (B11).
- (12) Lack of shared beliefs among the stakeholders. Trust issues among stakeholders can be obstacles to coordination (B12).
- (13) Data are not well integrated (B13).
- (14) Unintegrated priority program among various stakeholders (B14).
- (15) Some political parties control several regions with their agenda and interest (B15).
- (16) Lack of motivation to collaborate among stakeholders from various disciplines (B16).

TABLE 2: Result of Content Validity Analysis for a Barriers of coordination for food security in Central Java.

| Barrier factors | Expert 1 | Expert 2 | Expert 3 | Expert 4 | Expert 5 | Expert 6 | Experts in agreement | I-CVI |
|----------------------|----------|----------|----------|----------|----------|----------|----------------------|-------|
| BAR1 | 1 | 1 | 1 | 1 | 1 | 0 | 5 | 0.83 |
| BAR2 | 0 | 1 | 1 | 1 | 1 | 0 | 4 | 0.67 |
| BAR3 | 1 | 1 | 1 | 0 | 1 | 1 | 5 | 0.83 |
| BAR4 | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1.00 |
| BAR5 | 1 | 1 | 0 | 1 | 1 | 1 | 5 | 0.83 |
| BAR6 | 1 | 1 | 0 | 0 | 1 | 0 | 3 | 0.50 |
| BAR7 | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1.00 |
| BAR8 | 1 | 1 | 1 | 1 | 0 | 1 | 5 | 0.83 |
| BAR9 | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1.00 |
| BAR10 | 1 | 1 | 0 | 1 | 1 | 1 | 5 | 0.83 |
| BAR11 | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1.00 |
| BAR12 | 1 | 1 | 0 | 1 | 1 | 1 | 5 | 0.83 |
| BAR13 | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1.00 |
| BAR14 | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1.00 |
| BAR15 | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1.00 |
| BAR16 | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1.00 |
| BAR17 | 1 | 1 | 1 | 1 | 1 | 0 | 5 | 0.83 |
| BAR18 | 1 | 1 | 0 | 1 | 0 | 1 | 4 | 0.67 |
| BAR19 | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1.00 |
| BAR20 | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1.00 |
| BAR21 | 1 | 1 | 1 | 1 | 0 | 1 | 5 | 0.83 |
| BAR22 | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1.00 |
| BAR23 | 1 | 1 | 1 | 1 | 0 | 1 | 5 | 0.83 |
| BAR24 | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1.00 |
| BAR25 | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1.00 |
| BAR26 | 1 | 1 | 1 | 1 | 1 | 1 | 6 | 1.00 |
| BAR27 | 1 | 1 | 1 | 1 | 0 | 0 | 4 | 0.67 |
| Average ^a | 0.96 | 1.00 | 0.81 | 0.93 | 0.81 | 0.81 | S-CVI/Ave | 0.89 |

^a Average proportion of factor judged as relevance across the six experts.

- (17) Organizations have different ideas about what constitutes effective policy and how to solve challenges (B17).
- (18) Food security does not occupy the top priority of the government as their current focus is to fight COVID-19 (B18).
- (19) Less unformalized networks that bring a closer tie have more potential to work in a more flexible channel (B19).
- (20) Inadequate controlling and monitoring system of coordination within each stakeholder (B20).
- (21) Weak infrastructure is essential as a critical impediment to growth and coordination with other sectors (B21).
- (22) The inability of subnational governance to facilitate decentralized ownership to regional governments (B22).

4.2. The Result of Interpretative Structural Modelling.

Tables 3 and 4 displayed the Structural Self-Interaction Matrix (SSIM) based on experts 1 through expert 6. The following section shows how to use the symbols V, A, X, and O in SSIM. The A symbol represents that the j influences i, but i does not influence j, the O symbol represents that the i and j do not have any links, but if the X symbol is indicated that i have control over j and j also influences i (see Tables 3

until 8). The V sign represents that i influences j, but j does not have power over i.

Based on each SSIM (Tables 3–8), we translate the information in each SSIM cell into binary integers to build the initial reachability matrix (i.e., ones or zeros). In this case, if the input in cell “(i, j)” in SSIM is V, then the cell “(i, j)” input becomes 1, and the cell “(j, i)” input becomes 0. If the input in cell “(i, j)” in SSIM is A, then the cell “(i, j)” input becomes 0, and the cell “(j, i)” input becomes 1 in the initial reachability matrix. If the input in cell “(i, j)” in SSIM is X, then the inputs in both cells “(i, j)” and “(j, i)” become 1 in the initial reachability matrix. If the input in cell (i, j) in SSIM is O, then the inputs in both cells “(i, j)” and “(j, i)” become 0 in the initial reachability matrix. With six SSIM from six experts, the single value (ones or zeros) to include in the combined initial reachability matrix is determined by the consensus from six experts (if achieved) or by majority opinion on the paired comparison of the barriers. According to Malone [70], Watson [71], Broome et al. [72], and Sushil [73], if consensus is difficult to achieve, aggregating the value based on the majority view may be used. The combined initial reachability matrix is shown in Table 9. The final reachability matrix for the Coordination barrier for Food Security is shown in Table 10 after adding the transitivity process to the combined beginning reachability matrix. If barrier A is connected to barrier B and B to barrier C, then barrier A should be connected to barrier C throughout the transitivity process. The sign * denotes transitivity.

TABLE 3: ISSM from expert 1.

| No. | B22 | B21 | B20 | B19 | B18 | B17 | B16 | B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|
| B11 | X | X | A | A | O | X | X | A | O | A | O | O | V | A | O | O | A | X | X | A | X | |
| B21 | V | O | V | V | O | V | O | A | V | V | V | A | V | O | O | O | O | V | X | X | V | |
| B31 | X | V | A | A | O | A | X | O | V | V | X | A | X | A | O | A | O | V | X | | | |
| B41 | V | V | O | V | O | V | V | O | V | O | V | X | V | X | V | V | V | V | | | | |
| B51 | A | A | A | A | O | A | A | A | A | A | A | A | X | A | A | A | A | | | | | |
| B71 | O | V | O | O | A | O | O | A | A | O | O | A | O | V | V | | | | | | | |
| B81 | A | V | O | O | A | O | O | A | V | V | O | O | V | O | V | | | | | | | |
| B61 | A | O | O | O | O | O | O | O | V | O | O | A | O | | | | | | | | | |
| B91 | O | O | O | O | A | O | O | O | O | A | O | X | V | | | | | | | | | |
| B101 | A | V | V | V | O | A | V | A | O | V | V | A | | | | | | | | | | |
| B111 | A | V | V | V | O | V | V | O | V | O | V | V | | | | | | | | | | |
| B121 | V | O | X | X | V | X | X | A | X | X | | | | | | | | | | | | |
| B131 | A | V | A | A | O | A | O | A | | | | | | | | | | | | | | |
| B141 | A | V | A | A | A | A | A | A | | | | | | | | | | | | | | |
| B151 | A | O | O | O | V | O | O | | | | | | | | | | | | | | | |
| B161 | X | O | V | X | O | X | | | | | | | | | | | | | | | | |
| B171 | O | O | A | A | O | | | | | | | | | | | | | | | | | |
| B181 | O | O | O | V | | | | | | | | | | | | | | | | | | |
| B191 | A | O | A | | | | | | | | | | | | | | | | | | | |
| B201 | A | O | | | | | | | | | | | | | | | | | | | | |
| B211 | A | | | | | | | | | | | | | | | | | | | | | |
| B221 | | | | | | | | | | | | | | | | | | | | | | |

Where: B1i, B1j= barrier 1 or B1; B2i=B2j= barrier 2 or B2, etc.

Note: B1i, B1j= barrier 1 or B1; B2i=B2j= barrier 2 or B2, etc.

TABLE 4: ISSM from expert 6.

| No. | B22 | B21 | B20 | B19 | B18 | B17 | B16 | B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|
| B11 | X | A | X | X | O | X | X | A | X | X | X | X | A | X | A | X | X | X | X | X | X | X |
| B21 | X | A | V | X | O | X | X | O | X | A | X | A | X | X | O | X | X | X | X | X | X | V |
| B31 | X | X | X | X | O | X | X | O | X | A | X | A | X | X | A | X | X | X | X | A | X | |
| B41 | V | A | V | V | O | A | A | O | X | A | X | A | A | X | A | X | A | X | | | | |
| B51 | X | A | V | X | X | X | X | A | X | A | V | X | X | X | A | X | X | | | | | |
| B61 | X | X | V | V | X | V | X | A | X | V | X | X | X | X | X | X | | | | | | |
| B71 | X | X | X | X | O | V | X | O | X | X | X | X | A | X | | | | | | | | |
| B81 | X | A | A | V | O | X | O | V | X | X | X | X | X | | | | | | | | | |
| B91 | V | X | V | X | O | X | X | A | X | X | X | V | X | V | | | | | | | | |
| B101 | A | X | V | X | O | X | X | A | X | X | X | A | | | | | | | | | | |
| B111 | V | A | X | X | O | X | A | A | X | X | V | | | | | | | | | | | |
| B121 | X | A | X | X | O | A | X | V | X | X | | | | | | | | | | | | |
| B131 | V | A | X | X | X | X | X | A | X | | | | | | | | | | | | | |
| B141 | X | X | X | X | A | X | X | A | | | | | | | | | | | | | | |
| B151 | V | X | V | V | X | V | X | | | | | | | | | | | | | | | |
| B161 | V | X | X | X | X | X | | | | | | | | | | | | | | | | |
| B171 | V | X | X | X | V | | | | | | | | | | | | | | | | | |
| B181 | O | V | V | O | | | | | | | | | | | | | | | | | | |
| B191 | V | X | X | | | | | | | | | | | | | | | | | | | |
| B201 | X | V | | | | | | | | | | | | | | | | | | | | |
| B211 | V | | | | | | | | | | | | | | | | | | | | | |
| B221 | | | | | | | | | | | | | | | | | | | | | | |

Note: B1i, B1j= barrier 1 or B1; B2i=B2j= barrier 2 or B2, etc.

TABLE 5: ISSM from expert 2.

| No. | B22 | B21 | B20 | B19 | B18 | B17 | B16 | B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|
| B11 | O | A | O | O | O | O | O | O | X | X | O | O | X | O | O | O | O | O | O | O | O | O |
| B21 | O | O | X | X | O | X | X | O | X | X | O | O | X | O | O | O | O | X | O | O | X | X |
| B31 | O | X | X | X | O | O | X | O | X | X | O | O | O | O | O | X | O | X | O | | | |
| B41 | O | A | A | A | O | A | A | A | A | A | A | A | A | A | A | A | A | A | | | | |
| B51 | A | A | A | A | O | A | A | A | A | A | A | A | A | A | A | A | A | | | | | |
| B61 | A | O | O | A | A | A | O | A | O | O | A | A | A | O | A | | | | | | | |
| B71 | A | O | O | O | O | A | O | A | O | O | O | O | A | O | O | | | | | | | |
| B81 | V | A | V | A | O | V | V | O | V | V | V | V | V | V | O | | | | | | | |
| B91 | V | V | V | V | O | O | O | O | V | V | V | V | A | V | | | | | | | | |
| B101 | A | A | A | X | X | X | X | X | X | X | X | X | | | | | | | | | | |
| B111 | V | O | V | V | O | V | X | O | X | A | V | | | | | | | | | | | |
| B121 | V | O | O | X | O | X | X | O | X | O | O | V | | | | | | | | | | |
| B131 | O | X | X | X | O | O | O | O | V | | | | | | | | | | | | | |
| B141 | A | A | A | A | A | A | A | A | | | | | | | | | | | | | | |
| B151 | A | O | O | A | O | O | X | | | | | | | | | | | | | | | |
| B161 | A | A | A | A | O | X | | | | | | | | | | | | | | | | |
| B171 | A | O | A | A | O | | | | | | | | | | | | | | | | | |
| B181 | O | O | O | O | | | | | | | | | | | | | | | | | | |
| B191 | A | A | A | | | | | | | | | | | | | | | | | | | |
| B201 | A | A | | | | | | | | | | | | | | | | | | | | |
| B211 | O | | | | | | | | | | | | | | | | | | | | | |
| B221 | | | | | | | | | | | | | | | | | | | | | | |

Where: B1i, B1j= barrier 1 or B1; B2i=B2j= barrier 2 or B2, etc.

Note: B1i, B1j= barrier 1 or B1; B2i=B2j= barrier 2 or B2, etc.

The partitioning of the levels is determined by constructing the combined final reachability matrix. Warfield [55] suggests that the final reachability matrix may be used to determine each component’s reachability set and antecedent set. The reachability value assigned to a particular barrier considers both the barrier itself and any extra barriers that it may aid in overcoming. Similarly, the antecedent set for a particular barrier comprises the barrier and other impediments that help its removal. The intersection of the reachability and antecedent sets is then determined. In the ISM hierarchy, the top-level factor is assigned to the factor for which the reachability and intersection sets are equivalent and for which achieving any other factor beyond their level would be impossible. After identifying the top-level factor, it is segregated from the other components. Table 11 lists the 22 obstacles and their reachability set, antecedent set, intersection set, and level. The level partitioning is complete after nine rounds.

As seen in Table 11, six barriers have the same reachability set as an intersection set in the first iteration. Those barriers are B1 (complicated issue), B3 (insufficient sharing of information), B4 (ambiguities and lack of clarity), B5 (gap of coordination implementations between the rules and policies with the actual practical), B6 (fewer budget allocations for food security problems), B7 (different aims and priorities among multiple sectors and actors from different disciplines), B16 (lack of motivation to collaborate among stakeholders from various disciplines), and B21 (weak of infrastructure which is essential as a critical impediment to growth and coordination with other sectors). Those barriers are occupied in Level I or the top of the ISM hierarchy based on this condition. Those barriers are followed by B10 (lack of management commitment at the government level), B12 (lack of share beliefs among the stakeholders), B13 (data are not well integrated), B14 (unintegrated priority program among various stakeholders), and B19 (less of unformalized networks for coordination outside of official channels). B10, B12, B13, B14, and B19 are placed at the barrier in Level II. Thus, barrier B18 (food security does not occupy the government’s top priority as their current focus is to fight COVID-19) is placed at the barrier in Level III. Barrier B17 (organizations have different ideas about what constitutes effective policy and how to solve challenges) is placed at the barrier in Level IV. Then, barriers B15 (some political parties control several regions with their agenda and interest) and B20 (inadequate controlling and monitoring system of coordination within each stakeholder) are placed at the barrier in Level VI. At levels VII, VIII, and IX, we can see the barriers B2 (lack of communication and specialization in multisector collaboration), B9 (limited capability of regional government to handle the problem), and B8 (inadequate human resources with the competency and specific understanding of food security), successively. The final ISM model based on the partitioning level is given in Figure 1. The relationship between barriers i and j is described by an arrow directed from i to j. The resulting graph is called a digraph. Removing the transitivity described in the ISM methodology, the digraph is finally converted into the ISM model (see Figure 1).

TABLE 6: ISSM from expert 3.

| No. | B22 | B21 | B20 | B19 | B18 | B17 | B16 | B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|
| B11 | O | A | A | A | X | A | A | O | X | A | A | A | A | A | A | V | A | X | A | A | O | |
| B21 | X | V | O | V | O | O | O | O | O | O | O | O | V | O | V | V | X | V | O | | | |
| B31 | A | V | A | A | X | V | A | O | V | V | V | A | A | A | A | V | V | A | A | | | |
| B41 | A | V | V | A | X | A | A | O | V | A | A | A | A | A | A | V | V | A | | | | |
| B51 | X | A | V | A | V | V | O | O | V | V | O | V | V | A | A | V | V | | | | | |
| B61 | A | V | V | A | X | A | X | O | O | A | O | O | A | A | O | V | | | | | | |
| B71 | A | V | A | A | A | A | O | O | A | A | O | A | O | A | | | | | | | | |
| B81 | V | V | V | V | V | V | V | O | V | V | O | V | V | A | A | V | V | | | | | |
| B91 | V | V | A | A | V | A | A | O | O | V | O | O | O | | | | | | | | | |
| B101 | A | V | A | A | X | A | V | O | A | A | V | A | | | | | | | | | | |
| B111 | V | V | A | V | V | V | V | O | V | A | V | | | | | | | | | | | |
| B121 | O | A | A | A | V | A | V | O | O | A | | | | | | | | | | | | |
| B131 | X | A | A | A | V | A | A | O | V | | | | | | | | | | | | | |
| B141 | X | A | A | A | V | A | A | O | | | | | | | | | | | | | | |
| B151 | X | V | O | O | V | O | O | | | | | | | | | | | | | | | |
| B161 | A | X | A | V | V | O | | | | | | | | | | | | | | | | |
| B171 | X | O | A | A | V | | | | | | | | | | | | | | | | | |
| B181 | O | V | O | O | | | | | | | | | | | | | | | | | | |
| B191 | V | A | V | | | | | | | | | | | | | | | | | | | |
| B201 | V | A | | | | | | | | | | | | | | | | | | | | |
| B211 | X | | | | | | | | | | | | | | | | | | | | | |
| B221 | | | | | | | | | | | | | | | | | | | | | | |

Where: B1i, B1j= barrier 1 or B1; B2i=B2j= barrier 2 or B2, etc.

Note: B1i, B1j= barrier 1 or B1; B2i=B2j= barrier 2 or B2, etc.

TABLE 7: ISSM from expert 4.

| No. | B22 | B21 | B20 | B19 | B18 | B17 | B16 | B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|
| B11 | A | O | O | X | O | O | O | O | O | A | O | O | A | A | O | O | O | A | O | O | A | |
| B21 | O | O | O | X | O | O | O | O | O | X | O | O | X | O | O | O | O | O | X | O | O | |
| B31 | O | O | O | X | O | O | O | O | O | X | O | O | X | O | O | O | O | O | O | X | O | |
| B41 | O | O | O | O | O | O | O | O | O | X | O | O | O | O | O | O | O | O | O | X | O | |
| B51 | O | O | X | X | O | O | O | O | O | O | O | X | O | O | O | O | O | O | | | | |
| B61 | O | O | V | O | O | O | O | O | O | O | O | O | O | O | O | O | O | | | | | |
| B71 | O | O | A | O | O | O | O | O | O | O | O | O | O | O | O | O | | | | | | |
| B81 | O | O | V | O | O | O | O | O | O | O | O | O | O | V | V | | | | | | | |
| B91 | O | O | O | O | O | O | O | O | O | O | O | O | O | O | | | | | | | | |
| B101 | O | O | O | O | O | O | O | O | O | O | O | O | O | O | | | | | | | | |
| B111 | O | O | O | A | O | O | O | O | O | O | O | O | | | | | | | | | | |
| B121 | O | O | O | O | O | O | O | O | O | O | | | | | | | | | | | | |
| B131 | O | O | O | O | O | O | O | O | | | | | | | | | | | | | | |
| B141 | O | O | O | X | O | O | O | | | | | | | | | | | | | | | |
| B151 | O | O | O | O | O | O | | | | | | | | | | | | | | | | |
| B161 | O | O | O | A | O | O | | | | | | | | | | | | | | | | |
| B171 | O | O | O | A | O | | | | | | | | | | | | | | | | | |
| B181 | O | O | O | X | | | | | | | | | | | | | | | | | | |
| B191 | O | O | O | | | | | | | | | | | | | | | | | | | |
| B201 | O | O | | | | | | | | | | | | | | | | | | | | |
| B211 | O | | | | | | | | | | | | | | | | | | | | | |
| B221 | | | | | | | | | | | | | | | | | | | | | | |

Where: B1i, B1j= barrier 1 or B1; B2i=B2j= barrier 2 or B2, etc.

Note: B1i, B1j= barrier 1 or B1; B2i=B2j= barrier 2 or B2, etc.

TABLE 8: ISSM from expert 5.

| No. | B22 | B21 | B20 | B19 | B18 | B17 | B16 | B15 | B14 | B13 | B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|
| B11 | X | A | X | V | O | X | X | A | X | X | X | X | X | A | X | A | X | X | A | X | X | |
| B21 | X | A | V | X | O | X | X | O | X | A | X | A | X | X | O | X | X | X | V | V | | |
| B31 | X | X | X | X | O | X | X | O | X | A | X | A | X | X | A | X | X | X | X | | | |
| B41 | V | A | V | X | O | A | A | O | X | A | X | A | A | X | A | X | A | X | | | | |
| B51 | X | A | V | X | X | X | X | A | A | X | X | X | X | X | A | X | X | | | | | |
| B61 | X | X | V | V | X | V | X | A | A | X | V | X | X | X | X | X | X | | | | | |
| B71 | X | X | X | X | O | V | X | A | X | X | X | X | X | X | A | A | | | | | | |
| B81 | X | A | V | V | O | X | X | O | V | X | X | X | X | X | | | | | | | | |
| B91 | X | X | V | X | X | X | X | O | X | X | V | A | X | | | | | | | | | |
| B101 | A | X | X | X | O | X | X | A | X | X | X | A | | | | | | | | | | |
| B111 | V | A | X | X | O | X | X | A | X | X | X | | | | | | | | | | | |
| B121 | X | A | X | X | O | X | X | A | X | X | | | | | | | | | | | | |
| B131 | V | A | X | X | X | A | X | A | X | | | | | | | | | | | | | |
| B141 | X | X | V | X | A | X | X | A | | | | | | | | | | | | | | |
| B151 | V | V | V | V | X | X | X | | | | | | | | | | | | | | | |
| B161 | V | X | X | X | X | V | | | | | | | | | | | | | | | | |
| B171 | X | X | X | X | V | | | | | | | | | | | | | | | | | |
| B181 | O | X | V | O | | | | | | | | | | | | | | | | | | |
| B191 | V | X | X | | | | | | | | | | | | | | | | | | | |
| B201 | X | X | | | | | | | | | | | | | | | | | | | | |
| B211 | V | | | | | | | | | | | | | | | | | | | | | |
| B221 | | | | | | | | | | | | | | | | | | | | | | |

Note: B1i, B1j= barrier 1 or B1; B2i=B2j= barrier 2 or B2, etc.

From Figure 1, we can see that inadequate human resources with the competency and specific understanding of food security (B8) are a significant barrier to public policy coordination in handling food security. This barrier will influence the limited capability of the regional government to handle the problem (B9), and then the limited capability can cause a lack of communication and specialization in multisector collaboration (B2). Both barriers (limited capability and lack of communication and specialization) and lack of leader's role in giving guidance and working fast to deal with the situation can cause the inability of subnational governance to facilitate decentralized ownership to regional governments (B22).

The finding of this study, inadequate human resources with the competency and limited capability of the regional government become a significant barrier to public policy coordination in handling food security, is in line with Candarmaweni and Rahayu [13]. They found that handling stunting in the Pandeglang Regency still faces many barriers, including limited human resources, tools, budget, obstacles in coordination between the actors involved, and the local government's capacity to handle stunting at the village level. In this case, the level of knowledge of each actor will affect the way the actors interact. Then, mapping their knowledge and resources can make it easier for the collaborating actor to discover each other's shortcomings [13]. The importance of the competency of human resources in making the collaboration successful can also be traced back to Agranoff and McGuire [74] and Maxwell and Parker [75]. According to Agranoff and McGuire [74], there are two main factors to success in collaboration. One of them is resources, knowledge, and financial support. According to Maxwell and Parker [75], the challenge of food security is not just limited to having personnel available but also ensuring that deployed staffs are sufficiently qualified and experienced. Much has been made of the requirement for the right combination of technical knowledge, coordination skills, and people-management skills. Then, we cannot ignore the limited capability of the regional government to handle the problem (which is, in this study, its effect of inadequate human resources) because this capability is needed to handle complexity as the stunting policy and program usually involved many actors with different backgrounds and different interests. Complexity in government networks is natural and cannot be avoided. Moreover, it is related to complexity in returning decisions to complex problems and the interests of many actors who interact with each other to exchange information and resource [76].

The barrier is then divided into four quadrants using Matrice d'Impacts Croises-Multiplication Applique, or MICMAC analysis. MICMAC Analysis is an indirect classification approach based on each factor's driving power and dependence [58, 60]. The MICMAC analysis assists in determining the breadth of each factor. Table 9 (final combined reachability matrix) demonstrates that the driving power and dependency are achieved by inserting a binary number "1" into the relevant row and column for each barrier to public policy coordination. Each barrier's driving power and dependency may then be represented as a simple scatter plot,

TABLE 9: Combined initial reachability matrix.

| Barriers | B22j | B21j | B20j | B19j | B18j | B17j | B16j | B15j | B14j | B13j | B12j | B11j | B10j | B9j | B8j | B7j | B6j | B5j | B4j | B3j | B2j | B1j |
|----------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| B1i | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B2i | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 |
| B3i | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| B4i | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| B5i | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B6i | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| B7i | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| B8i | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 |
| B9i | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| B10i | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| B11i | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| B12i | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| B13i | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| B14i | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B15i | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| B16i | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| B17i | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| B18i | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| B19i | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| B20i | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| B21i | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |
| B22i | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |

Where: B1i, B1j= barrier 1 or B1; B2i=B2j= barrier 2 or B2, etc

Note: B1i, B1j= barrier 1 or B1; B2i= B2j= barrier 2 or B2, etc

TABLE 10: Combined final reachability matrix.

| No. | B22j | B21j | B20j | B19j | B18j | B17j | B16j | B15j | B14j | B13j | B12j | B11j | B10j | B9j | B8j | B7j | B6j | B5j | B4j | B3j | B2j | B1j | driving power |
|------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------------|
| B1i | 1 | 0 | 1* | 1* | 1 | 1* | 1 | 0 | 0 | 1 | 0 | 1* | 1* | 1 | 0 | 1* | 0 | 1* | 1* | 0 | 1* | 0 | 14 |
| B2i | 1* | 1 | 1 | 1 | 1 | 1* | 1 | 0 | 0 | 1* | 1* | 1* | 1 | 1 | 1* | 1* | 1 | 0 | 1 | 1 | 1* | 1 | 19 |
| B3i | 1 | 0 | 1 | 1* | 1 | 1* | 1 | 0 | 0 | 1* | 1* | 1 | 1 | 1 | 0 | 1 | 1* | 1* | 1* | 1* | 1 | 1* | 18 |
| B4i | 1 | 1 | 1 | 1 | 1* | 1 | 1 | 0 | 0 | 1* | 0 | 1* | 1* | 1 | 0 | 1* | 1* | 0 | 1* | 1* | 1 | 1* | 17 |
| B5i | 1 | 1* | 1 | 1 | 1 | 1* | 1* | 0 | 0 | 1* | 0 | 1* | 1* | 1 | 0 | 1* | 0 | 0 | 0 | 0 | 1* | 0 | 13 |
| B6i | 1 | 0 | 1* | 1 | 1 | 1 | 1* | 0 | 0 | 1* | 0 | 0 | 0 | 1* | 0 | 1* | 0 | 0 | 1* | 1* | 1 | 0 | 12 |
| B7i | 1* | 0 | 1 | 1* | 1 | 1* | 1 | 0 | 0 | 0 | 0 | 1* | 1* | 1* | 0 | 1* | 0 | 0 | 1* | 1* | 1 | 0 | 13 |
| B8i | 1 | 0 | 1* | 1 | 1 | 1 | 1* | 1 | 0 | 1* | 1* | 1 | 1 | 1* | 1* | 1 | 1 | 1* | 1* | 1 | 1* | 1 | 20 |
| B9i | 1 | 1* | 1 | 1 | 1 | 1 | 1* | 0 | 1 | 1 | 1* | 1* | 1 | 1 | 1* | 1* | 1* | 1* | 1* | 1* | 1 | 1 | 21 |
| B10i | 1 | 1* | 1 | 1 | 1 | 1* | 1* | 0 | 0 | 1 | 1* | 1 | 1 | 1* | 0 | 1 | 1* | 1 | 1 | 1* | 1 | 1* | 19 |
| B11i | 1 | 1* | 1 | 1 | 1 | 1 | 1* | 0 | 1 | 1 | 1 | 1 | 1* | 1* | 1 | 1 | 1* | 1 | 1 | 1 | 1 | 1 | 21 |
| B12i | 1 | 1* | 1* | 1 | 1 | 1* | 1* | 0 | 0 | 1* | 1* | 1 | 1 | 1 | 1* | 1 | 1 | 1 | 1 | 1* | 1* | 1 | 20 |
| B13i | 1 | 1* | 1* | 1 | 1 | 1* | 1* | 0 | 1* | 1 | 1 | 1 | 1 | 1 | 0 | 1* | 1* | 1* | 1* | 1* | 1 | 1* | 20 |
| B14i | 1 | 0 | 1* | 1 | 1 | 1* | 1* | 0 | 0 | 1 | 0 | 1* | 1* | 1 | 0 | 1* | 0 | 1* | 1* | 0 | 1* | 0 | 14 |
| B15i | 1* | 0 | 1* | 1* | 1 | 1* | 1* | 0 | 0 | 1 | 0 | 1* | 1* | 1 | 1 | 1* | 0 | 1 | 1* | 0 | 1* | 0 | 15 |
| B16i | 1 | 1* | 1 | 1* | 1 | 1 | 1 | 0 | 0 | 1* | 1* | 1 | 1 | 1 | 0 | 1 | 1 | 1* | 1 | 0 | 1* | 1* | 18 |
| B17i | 1 | 1* | 1* | 1 | 1 | 1* | 1 | 0 | 0 | 1 | 1* | 1 | 1 | 1 | 0 | 1 | 1 | 1* | 1* | 0 | 1* | 1* | 18 |
| B18i | 1* | 0 | 1* | 1* | 1* | 1 | 1 | 0 | 0 | 1 | 0 | 1* | 1* | 1 | 0 | 1* | 0 | 1 | 1* | 0 | 1* | 0 | 14 |
| B19i | 1 | 1* | 1 | 1 | 1 | 1 | 1* | 0 | 0 | 1 | 1* | 1 | 1 | 1 | 0 | 1 | 1 | 1* | 1 | 0 | 1* | 1* | 18 |
| B20i | 1 | 0 | 1 | 1* | 1 | 1* | 1* | 0 | 0 | 1 | 1* | 1 | 1 | 1 | 0 | 1 | 1 | 1* | 1 | 1 | 1* | 1* | 18 |
| B21i | 1 | 0 | 1* | 1* | 1 | 1* | 1* | 0 | 0 | 1* | 1* | 1* | 1 | 1 | 0 | 1 | 1* | 0 | 1 | 1 | 1 | 0 | 16 |
| B22i | 1* | 0 | 1 | 1* | 1 | 1 | 1 | 0 | 0 | 1 | 1* | 1* | 1 | 1 | 1 | 1 | 1 | 1* | 1 | 1 | 1 | 1 | 18 |
| dependence power | 22 | 11 | 22 | 22 | 22 | 22 | 22 | 1 | 3 | 21 | 14 | 21 | 21 | 22 | 7 | 22 | 5 | 61 | 21 | 14 | 22 | 41 | |

Where: B1i, B1j= barrier 1 or B1; B2i=B2j= barrier 2 or B2, etc.

Note: B1i, B1j= barrier 1 or B1; B2i= B2j= barrier 2 or B2, etc.

TABLE 11: Level partitions for the barrier of coordination for food security.

| Iteration | Variable | Reachability set | Antecedent set | Intersection set | |
|-----------|----------|--|---|--|-----------------------|
| I | 1 | 1j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,18j,19j,21j | 1i,2i,3i,4i,5i,6i,7i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,21i,22i, | 1j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,18j,19j,21j | |
| | 2 | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,15j,16j,17j,19j,20j,21j,22j | 2i,4i,5i,9i,10i,11i,12i,13i,14i,15i,16i,17i,19i | 2j,4j,5j,10j,11j,12j,13j,16j,17j,19j | |
| | 3 | 1j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,20j,21j,22j | 1i,2i,3i,4i,5i,6i,7i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,21i,22i, | 1j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,20j,21j,22j | |
| | 4 | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,20j,21j,22j | 1i,2i,3i,4i,5i,6i,7i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,21i,22i, | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,20j,21j,22j | |
| | 5 | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,21j | 1i,2i,3i,4i,5i,6i,7i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,21i,22i, | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,21j | |
| | 6 | 1j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,19j,20j,21j | 1i,2i,3i,4i,5i,6i,7i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,21i,22i, | 1j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,19j,20j,21j | |
| | 7 | 1j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,19j,20j,21j | 1i,2i,3i,4i,5i,6i,7i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,21i,22i, | 1j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,19j,20j,21j | |
| | 8 | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,20j,21j,22j | 8i | 8j | |
| | 9 | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,20j,21j,22j | 9i,11i,13i | 9j,11j,13j | |
| | 10 | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,20j,21j,22j | 1i,2i,3i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,19i,20i,21i,22i, | 1j,2j,3j,4j,5j,6j,10j,11j,12j,13j,14j,16j,17j,18j,19j,20j,21j,22j | |
| | 11 | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,20j,21j,22j | 2i,3i,8i,9i,10i,11i,12i,13i,16i,17i,19i,20i,21i,22i | 2j,3j,9j,10j,11j,12j,13j,16j,17j,19j,20j,21j,22j | |
| | 12 | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,20j,21j,22j | 1i,2i,3i,4i,5i,6i,7i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,21i,22i, | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,20j,21j,22j | |
| | 13 | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,20j,21j,22j | 1i,2i,3i,4i,5i,6i,7i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,21i,22i, | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,20j,21j,22j | |
| | 14 | 1j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,18j,19j,21j | 1i,2i,3i,4i,5i,6i,7i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,21i,22i, | 1j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,18j,19j,21j | |
| | 15 | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,21j,22j | 2i,8i,9i,11i,12i,15i,22i | 2j,11j,12j,22j | |
| | 16 | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,21j,22j | 1i,2i,3i,4i,5i,6i,7i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,21i,22i, | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,21j,22j | |
| | 17 | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,21j,22j | 1i,3i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,22i | 1j,3j,4j,10j,11j,12j,13j,16j,17j,19j,21j,22j | |
| | 18 | 1j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,18j,19j,21j | 1i,3i,4i,6i,7i,8i,9i,10i,11i,12i,13i,20i,21i,22i | 1j,3j,4j,6j,7j,10j,11j,12j,13j,14j,16j,18j,19j | |
| | 19 | 1j,2j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,21j,22j | 1i,2i,3i,4i,6i,7i,8i,9i,10i,11i,12i,13i,20i,21i,22i | 1j,2j,3j,4j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,21j,22j | |
| | 20 | 1j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,18j,19j,20j,21j,22j | 2i,3i,4i,6i,7i,8i,9i,10i,11i,12i,13i,20i,21i,22i | 3j,4j,6j,7j,10j,11j,12j,13j,20j,21i,22j | |
| | 21 | 1j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,19j,20j,21j | 1i,2i,3i,4i,5i,6i,7i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,21i,22i, | 1j,3j,4j,5j,6j,7j,10j,11j,12j,13j,14j,16j,17j,19j,20j,21j | |
| | 22 | 1i,3i,4i,5i,6i,7i,10i,11i,12i,13i,14i,16i,17i,18i,19i,20i,21i,22i | 2i,3i,4i,8i,9i,10i,11i,12i,13i,16i,17i,19i,20i,22i | 3i,4i,10i,11i,12i,13i,16i,17i,19j,20j,22i | |
| II | 2 | 2j,10j,11j,12j,13j,14j,15j,17j,19j,20j,22j | 2i,4i,5i,9i,10i,11i,12i,13i,16i,17i,19i | 2j,10j,11j,12j,13j,17j,19j | |
| | 8 | 2j,8j,9j,10j,14j,15j | 8i | 8j | |
| | 9 | 2j,9j,10j,11j,12j,13j,14j,15j,17j,18j,19j,20j,22j | 9i,11i,13i | 9j,11j,13j | |
| | 10 | 2j,10j,11j,12j,13j,14j,17j,18j,19j,20j,22j | 1i,2i,3i,4i,5i,6i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,21i,22i, | 2j,10j,11j,12j,13j,14j,17j,18j,19j,20j,22j | |
| | 11 | 2j,9j,10j,11j,12j,13j,14j,15j,17j,18j,19j,20j,22j | 2i,3i,8i,9i,10i,11i,12i,13i,16i,17i,19i,20i,21i,22i | 2j,9j,10j,11j,12j,13j,17j,19j,20j,22j | |
| | 12 | 2j,10j,11j,12j,13j,14j,15j,17j,18j,19j,20j,22j | 1i,2i,3i, | 2j,10j,11j,12j,13j,14j,15j,17j,18j,19j,20j,22j | |
| | 13 | 2j,9j,10j,11j,12j,13j,14j,17j,18j,19j,20j,22j | 2i,8i,9i,11i,12i,15i,22i | 2j,9j,10j,11j,12j,13j,14j,17j,18j,19j,20j,22j | |
| | 14 | 2j,10j,11j,12j,13j,14j,18j,19j | 2i,3i,4i,8i,9i,10i,11i,12i,13i,16i,17i,19i,20i,21i,22i | 10j,12j,13j,14j,18j,19j | |
| | 15 | 2j,10j,11j,12j,13j,14j,17j,18j,19j,22j | 1i,3i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,21i,22i | 2j,10j,11j,12j,13j,17j,19j,22j | |
| | 17 | 2j,10j,11j,12j,13j,14j,17j,18j,19j,22j | 1i,3i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,21i,22i | 10j,12j,13j,14j,18j,19j | |
| | 18 | 10j,12j,13j,14j,18j,19j | 1i,2i,3i,4i,6i,7i,8i,9i,10i,11i,12i,13i,20i,21i,22i, | 2j,10j,11j,12j,13j,14j,18j,19j | |
| | 19 | 2j,10j,11j,12j,13j,14j,17j,18j,19j,22j, | 2i,3i,4i,6i,7i,8i,9i,10i,11i,12i,13i,20i,21i,22i, | 2j,10j,11j,12j,13j,14j,17j,18j,19j,22j | |
| | 20 | 10j,11j,12j,13j,14j,17j,18j,19j,20j,22j | 2i,3i,4i,6i,7i,8i,9i,10i,11i,12i,13i,20i,21i,22i, | 2j,10j,11j,12j,13j,14j,17j,18j,19j,20j,22j | |
| | 22 | 10j,11j,12j,13j,14j,15j,17j,18j,19j,20j,22j | 2i,3i,4i,8i,9i,10i,11i,12i,13i,16i,17i,19i,20i,22i | 10j,11j,12j,13j,17j,19j,20j,22j | |
| | III | 2 | 2j,11j,15j,17j,20j,22j | 2i,4i,5i,9i,10i,11i,12i,13i,16i,17i,19i | 2j,11j,15j,17j |
| | | 8 | 2j,8j,9j,15j | 8i | 8j |
| | | 9 | 2j,9j,11j,15j,17j,18j,20j,22j | 9i,11i,13i | 9j,11j |
| | | 11 | 2j,9j,11j,15j,17j,18j,20j,22j | 2i,3i,8i,9i,10i,11i,12i,13i,16i,17i,19i,20i,21i,22i | 2j,9j,11j,17j,20j,22j |
| | | 15 | 2j,11j,17j,18j,22j | 2i,8i,9i,11i,12i,15i,22i | 2j,11j,22j |
| | | 17 | 2j,11j,17j,18j,22j | 2i,3i,4i,8i,9i,10i,11i,12i,13i,16i,17i,19i,20i,21i,22i | 2j,11j,17j,22j |
| | | 18 | 18j | 1i,3i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,22i | 18j |
| | | 20 | 11j,17j,18j,20j,22j | 2i,3i,4i,6i,7i,8i,9i,10i,11i,12i,13i,20i,21i,22i, | 11j,20j,22j |
| 22 | | 11j,15j,17j,18j,20j,22j | 2i,3i,4i,8i,9i,10i,11i,12i,13i,16i,17i,19i,20i,22i | 11j,17j,20j,22j | |
| IV | | 2 | 2j,11j,15j,17j,20j,22j | 2i,4i,5i,9i,10i,11i,12i,13i,16i,17i,19i | 2j,11j,17j |
| | | 8 | 2j,8j,9j,15j | 8i | 8j |
| | | 9 | 2j,9j,11j,15j,17j,18j,20j,22j | 9i,11i,13i | 9j,11j |
| | | 11 | 2j,9j,11j,15j,17j,18j,20j,22j | 2i,3i,8i,9i,10i,11i,12i,13i,16i,17i,19i,20i,21i,22i | 2j,9j,11j,17j,20j,22j |
| | | 15 | 2j,11j,17j,22j | 2i,8i,9i,11i,12i,15i,22i | 2j,11j,22j |
| | | 17 | 2j,11j,17j,22j | 2i,3i,4i,8i,9i,10i,11i,12i,13i,16i,17i,19i,20i,21i,22i | 2j,11j,17j,22j |
| | | 18 | 18j | 1i,3i,8i,9i,10i,11i,12i,13i,14i,15i,16i,17i,18i,19i,20i,22i | 18j |
| | | 20 | 11j,17j,18j,20j,22j | 2i,3i,4i,6i,7i,8i,9i,10i,11i,12i,13i,20i,21i,22i, | 11j,20j,22j |
| | | 22 | 11j,15j,17j,18j,20j,22j | 2i,3i,4i,8i,9i,10i,11i,12i,13i,16i,17i,19i,20i,22i | 11j,17j,20j,22j |

TABLE 11: Continued.

| Iteration | Variable | Reachability set | Antecedent set | Intersection set |
|-----------|----------|-----------------------|---|------------------------|
| V | 2 | 2j,11i,15j,20j,22j | 2i,4i,5i,9i,10i,11i,12i,13i,16i,17i,19i' | 2j,11ij, |
| | 8 | 2j, 8j, 9j,15j | 8i | 8j |
| | 9 | 2i,9j,11j,15j,20j,22j | 9i,11i,13i | 9ij,11ij |
| | 11 | 2j,9j,11j,15j,20j,22j | 2i,3i,8i,9i,10i,11i,12i,13i,16i,17i,19i,20i,21i,22i | 2ij,9ij,11ij,20ij,22ij |
| | 15 | 2j,11j,22j | 2i,8i,9i,11i,12i,15i,22i | 2j,11ij,22ij |
| VI | 20 | 11j,20j,22j | 2i,3i,4i,6i,7i,8i,9i,10i,11i,12i,13i,20i,21i,22i | 11ij,20ij,22ij |
| | 22 | 11j,15j,20j,22j | 2i,3i,4i,8i,9i,10i,11i,12i,13i,16i,17i,19i,20i,22i | 11ij,20ij,22ij |
| | 2 | 2j,11j,22j | 2i,4i,5i,9i,10i,11i,12i,13i,16i,17i,19i' | 2j,11ij |
| | 8 | 2j, 8j, 9j | 8i | 8j |
| | 9 | 2j,9j,11j,22j | 9i,11i,13i | 9ij,11ij |
| VII | 11 | 2j,9j,11j,22j | 2i,3i,8i,9i,10i,11i,12i,13i,16i,17i,19i,20i,21i,22i | 2ij,9ij,11ij,22ij |
| | 22 | 11j,22j | 2i,3i,4i,8i,9i,10i,11i,12i,13i,16i,17i,19i,20i,22i | 11ij,22ij |
| | 2 | 2j | 2i,4i,5i,9i,10i,11i,12i,13i,16i,17i,19i' | 2j |
| | 8 | 2j, 8j, 9j | 8i | 8j |
| | 9 | 2j,9j | 9i,11i,13i | 9ij |
| VIII | 8 | 8j, 9j | 8i | 8j |
| | 9 | 9j | 9i,11i,13i | 9ij |
| | 8 | 8j | 8i | 8j |

Note: i, j = barrier 1 or B1; $2i = 2j$ = barrier 2 or B2, etc.

TABLE 12: The summary of proposed policies from six experts, the first round of the Delphi Method.

| Barrier | Proposed policies |
|---|--|
| Inadequate human resources with the competency and specific understanding of food security (B8) | <p>(1) Develop capacity building of human resources through education/training, not only for the public employee responsible for handling the food security program but also for the nongovernment stakeholder (such as universities, community, and the other actor) to strengthen their role in the nongovernment agency for food security (PB81)</p> <p>(2) Build the formal media (such as a regular e-mail or magazine) for the dissemination of knowledge and technology in the food sector, as well as food security and counseling (PB82)</p> <p>(3) Develop standards of human resource competence in dealing with food insecurity concerns, managing complex information systems and performing multisectoral analyses, building and implementing information systems that measure and monitor food insecurity and vulnerability (PB83)</p> |
| Limited capability of regional government to handle the problem (B9) | <p>(1) Build institutional arrangements related to the distribution of authority, the protocol, procedure, and structure organization to manage multiple actors related to food security program, such as giving the village government clear guidance in making programs and activities to handle food insecurity, and this must be legalized in village meetings (food insecurity programs should be more focused on preventing stunting in villages because most of the problems are in the village) (PB91)</p> <p>(2) Build clear procedures that regulate accountability and penalties for instances where local governments fail to respond to food insecurity incidence otherwise to ensure food security (PB92)</p> <p>(3) The decision-making in state governing and public services is expected to be simpler and faster because the closest regional government can execute it per the existing authority (PB93)</p> |
| Lack of communication and specialization in multisector collaboration (B2) | <p>(1) Develop a technical and standard operating procedure for effective intersectoral and cross-ministerial linkages to promote coordination (starting from setting priorities by all stakeholders, planning process, funding allocation until implementing the program) (PB21)</p> <p>(2) Clarity of the current coordinating body in developing strategic policy for food and nutrition (RAN-PG and STANDS stunting) that facilitates cooperation across ministries and sectors and establishes linkages between the national plan and sectoral plans, including the broader development framework and strategy of the country (PB22)</p> <p>(3) Build compatibility (periodicity, spatial coverage, sample selection, selection of indicators, and storage and data management) that would facilitate use by other sectors and share knowledge about available data or information to avoid frequent duplication of data collection and analysis efforts as well as the waste of resources (PB23)</p> <p>It can be done by using the whole-of-government account (WGA), which consolidates more than 5500 agency accounts in the public sector to promote sharing of data collection tasks and information and transparency and accountability. The WGA provides convenience for the public or specific stakeholders in accessing financial reports and understanding the financial position at a macro level. This WGA paves access to information between sectors to align stakeholders' knowledge. Additionally, by using WGA, the emphasis on information gathering and analysis may be shifted away from the particular sectoral or subsectoral unit's objectives and toward generating possible efficiencies via the consolidation or rationalization of disparate information systems</p> <p>(4) Develop a technical and standard operating procedure for sharing responsibilities and strengthening collaboration and communication (PB24)</p> <p>(5) Develop a shared vision and orientation of each involved sector that can reduce competition or competition between sectors (PB25)</p> |

as illustrated in Figure 2. "Autonomous barriers" are denoted by the first quadrant. Barriers in this quadrant have low dependence and driving power. Because they have few weak linkages with other barriers, barriers in this quadrant are largely detached from the system. The second quadrant

denotes the "dependent barriers." Barriers in this quadrant have a high degree of dependence but low driving power. "Linkage barriers" are denoted by the third quadrant. Barriers have a high degree of dependency and driving power in this quadrant. These barriers are unstable since

TABLE 13: Second rounds of the Delphi Method.

| Proposed policies | Expert | | | | | | Mean |
|-------------------|----------|-------------|----------|----------|----------|----------|------|
| | Expert 1 | Expert 2 | Expert 3 | Expert 4 | Expert 5 | Expert 6 | |
| PB81 | 5 | 4 | 4 | 5 | 4 | 4 | 4.33 |
| PB82 | 5 | 4 | 4 | 5 | 5 | 5 | 4.67 |
| PB83 | 4 | 5 | 5 | 5 | 5 | 4 | 4.67 |
| PB91 | 5 | 5 | 5 | 5 | 5 | 5 | 5.00 |
| PB92 | 4 | 5 | 4 | 5 | 5 | 5 | 4.67 |
| PB93 | 5 | 5 | 5 | 5 | 5 | 5 | 5.00 |
| PB21 | 5 | 5 | 5 | 5 | 5 | 5 | 5.00 |
| PB22 | 5 | 5 | 5 | 5 | 5 | 5 | 5.00 |
| PB23 | 5 | 5 | 5 | 5 | 5 | 5 | 5.00 |
| PB24 | 4 | 2 | 3 | 4 | 3 | 3 | 3.17 |
| PB25 | 3 | 3 | 4 | 4 | 3 | 3 | 3.33 |
| <i>N</i> | 6 | | | | | | |
| | | Kendall's W | 0.743 | | | | |
| | | Chi-square | 44.609 | | | | |
| | | Df | 10 | | | | |
| | | Asymp. Sig. | 0.000 | | | | |

each action affects other barriers and has a negative feedback loop. Finally, the fourth quadrant represents “independent barriers.” Barriers in this quadrant have a low dependence and a high driving power (see Figure 2).

The result of mapping the dependence and driving power of each barrier in Figure 2 indicates the following:

- (1) Two barriers fall into independent barriers, namely, B8 and B9. These barriers occupy the bottom of the ISM digraph
- (2) Most barriers fall in linkage barriers. There were twelve linkage barriers, namely, B2, B3, B4, B10, B11, B12, B13, B16, B17, B19, B20, and B22. These barriers occupy the middle of the ISM digraph. This condition indicated that most of the coordination barriers in handling food security are not independent since most of the barriers influence the other barriers and influence the other barriers. For example, B2 or lack of communication and specialization in multisector collaboration influences B22 or the inability of subnational governance to facilitate decentralized ownership to the regional government. On the other side, B2 or lack of communication is also influenced and influenced by B9 or limited the capability of regional government to handle the problem
- (3) Seven barriers fall into the dependent barriers, namely, B1, B5, B6, B7, B14, B18, and B21

4.3. One Barrier Falls in the Autonomous Barrier, Namely, B15. Based on our finding, in managerial implication, this study has some suggestions for government and policymaking to improve the coordination among stakeholders in dealing with food security in Central Java Province. By checking the underlying barrier, this study might act as a valuable input for decision-making to allocate their effort in handling the barrier. The government/policymaking cannot emphasize all the barriers simultaneously; the government of policymaking needs to categorize the barriers into several

groups for ease of handling to improve the coordination among stakeholders in dealing with food security in Central Java Province. Moreover, after grouping, the government or policymaking needs to identify which barriers influence the system to mitigate them early. Besides, perhaps efforts to mitigate the most influence barrier provide a solution for other barriers associated with that barrier.

4.4. Policy Recommendation Based on Delphi Method. In this study, two rounds of the Delphi Method were used to formulate the proposed policies to mitigate three significant barriers of public policy coordination in handling food security as it occupies the top three the base of ISM Digraph. In this case, the proposed policies were used to mitigate B8, B9, and B2. The summary of proposed policies for each barrier as the result of the first round of the Delphi Method can be seen in Table 12.

The second round was then conducted using closed-ended questions based on the recommended policies acquired in the previous round. Table 13 contains the results of the second round.

Except for PB24 and PB25, all suggested policies received a 4.0 or higher average rating in round 2. It indicates that, except for PB24 and PB25, the suggested policies would be considered essential alternatives. Kendall's W test results for the second round are likewise included in Table 13. The Delphi procedure may be terminated since Kendall's W in the second round is more than 0.500 (0.743). Kendall's coefficient of concordance (Kendall's W) reflects the extent to which participants agree [69]. Kendall's W is a numeric value between 0 and 1, showing the degree of agreement obtained by the participants; specifically, Kendall's W of more than 0.7 suggests a strong consensus; Kendall's W of 0.5 indicates a moderate consensus, and Kendall's W less than 0.3 indicates a weak consensus [69]. So, the final proposed policies according to their rank are as follows: build institutional arrangements related to the distribution of authority, the protocol, procedure, and structure

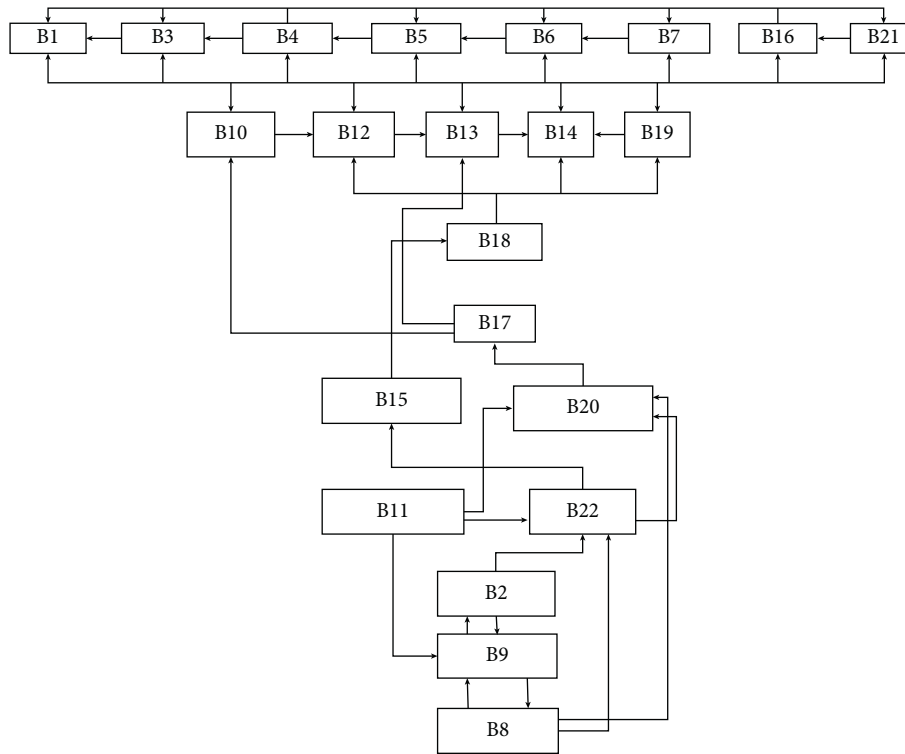


FIGURE 1: ISM Digraph.

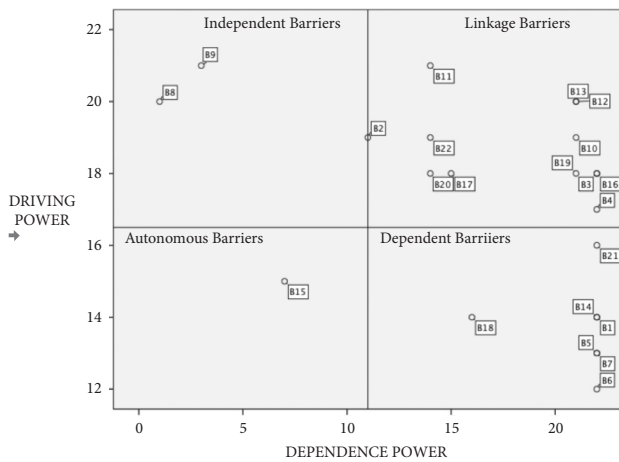


FIGURE 2: Driving power and dependence power diagram.

organization to manage multiple actors (PB91), strengthen the policy of decentralization and regional autonomy (PB93), develop technical and standard operating procedure for effective intersectoral and cross-ministerial linkages (PB21), clarify the current coordinating body in developing strategic policy for food and nutrition (PB22), build a compatibility that would facilitate use by other sectors and share knowledge about available data or information to avoid frequent duplication of data collection and analysis efforts as well as waste of resources (PB23), build the formal media for dissemination of knowledge and technology in the food sector, as well as food security and counseling (PB82), develop standard competency (PB83), build clear

procedures that regulate accountability and penalties for instances (PB92), and develop capacity building of human resource through education/training (PB81).

5. Conclusion

This research aimed to investigate the underlying barriers that may prevent public policy coordination among stakeholders in dealing with food security in Central Java Province and suggest some recommendations to enhance the coordination. After the content validation process, this study identified 22 barriers. The ISM results indicated that complicated problem of a food security issue (B1), insufficient sharing of information because many organizations perform to horde information (B3), ambiguities, and lack of clarity surrounding authority over setting policy directions and making decisions in a (legal) normative manner (B4), a gap of coordination implementations between the rules and policies with the actual practical (B5), fewer budget allocations for food security problems (B6), different aims and priorities among multiple sectors and actors from different disciplines (B7), lack of motivation to collaborate among stakeholders from various disciplines (B16), and weak of infrastructure which is essential as the critical impediment to growth and coordination with other sectors (B21) as the highest level that affected the remaining barriers. The ISM analysis found three very significant barriers to policy coordination among stakeholders in dealing with food security, namely, inadequate human resources with the competency and specific understanding of food security (B8), the limited capability of regional

Governments to handle the problem (B9), and lack of communication and specialization in multisector collaboration (B2). Then, several policies have been proposed and validated by a panel of experts to mitigate those barriers.

There are several limitations to this study. First, the study is confined to the barriers to public policy coordination that Semarang City, Indonesia, has and overlooks other barriers to public policy coordination that other places or countries face. Future studies should focus on diverse places or nations or compare different regions or countries. The second limitation is that expert judgments regarding policies may be biased, and the third limitation is that the efficacy of policies recommended is not evaluated in a real-world setting. Future studies should include more experts from various stakeholder groups involved in food security policies and programs, as well as test the recognized policies for public policy coordination in dealing with food security in the real world or even create a simulation model to test the effect of policies on public policy coordination effectiveness.

Data Availability

The original contributions presented in the study are included in the article/supplementary material. Further inquiries can be directed to the corresponding author.

Ethical Approval

Ethical review and approval were not required for this government program evaluation study. The researchers sent the request letter to the potential respondents prior to participating in this study. Moreover, prior to the interview, the researchers requested their consent to be recorded and assured the safety and security of the data.

Conflicts of Interest

The authors declare that the research was conducted without any commercial or financial relationships that could be construed as potential conflicts of interest.

Authors' Contributions

A.S., N.S., H.D., and Y.P. conceived and designed the study. In addition, R.P. and A.F. participated in the acquisition of data, while A.S., R.P., and A.F. analyzed the data. A.S. and N.S. supplied advice on its methodology. A.S. drafted the manuscript, and then H.D. revised the manuscript. AS is the guarantor of this work and had full access to all the data in the study and takes responsibility for its integrity and the accuracy of the data analysis. All authors read and approved the final manuscript.

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