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PENTAHELIX COLLABORATION IN THE IMPLEMENTATION OF AGRICULTURAL POLICIES FOR REGIONAL FOOD SECURITY: A STUDY IN THE HARVEST FAILURE-PRONE AREA OF KAWAY XVI DISTRICT, WEST ACEH REGENCY

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Abstract: : *This study is novel in that it examines the pentahelix collaboration model in the context of regional food policy. Until now, similar studies have been limited to sectoral approaches and have not focused on areas prone to crop failure in strengthening food security, which is a research gap. The main objective of this study is to determine how the pentahelix collaboration model is implemented in agricultural policy for food security in West Aceh Regency. The method used is a qualitative case study approach. The results show that the form of pentahelix collaboration can be seen from the roles of various actors. The theoretical contribution can expand and enrich the application of the pentahelix concept by adding a focus on crop failure, agrarian risks, and food security in the collaborative concept. Meanwhile, the practical contribution through the research results serves as a guide for the government in strengthening the collaborative concept. The essence of pentahelix is to carry out a coordinating function in food agriculture policy. The weakness of implementing agricultural policy through the pentahelix approach in West Aceh is the lack of specific regulations, such as standard operating procedures that regulate the flow of collaboration across actors. The limitations of the study are evident in the limited perspectives of the actors. A recommendation for the future is to create and establish a cross-actor forum to serve as a platform for disseminating information on agricultural food in West Aceh.*

Keywords : *pentahelix; agricultural policy; food; crop failure; food insecurity.*

INTRODUCTION

The issue of food security has become a global concern, as food security is related to the basic needs for survival (Suarsana, 2020). In Indonesia, food security is one of the programs in the government's eight pillars. According to (Quaralia, 2022; Müller, 2014; Villacis et al., 2022) one of the foundations that contributes to food security is the agricultural sector. Similarly, (Rantau et al., n.d.)bstated that the agricultural sector is one of the government's focuses because it serves as the main pillar of food security and a source of employment for the community. Thus, the agricultural sector is a modality for the country because it contributes to the country's economic growth (Dev, 2015; Patel & Murthy, 2017; Xuezhen et al., 2010). As an agricultural country, 40% of Indonesia's population derives their livelihood from the agricultural sector (Ayun et al., 2020). Indonesia's agricultural sector is supported by abundant natural resources in achieving the nation's ideals and goals (Rhofita, 2022). The main objective

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of agricultural development is to strengthen food security (Sihombing, 2022). Efforts to strengthen food security can be carried out by implementing agricultural policies. According to (Septiadi & Nursan, 2020), agricultural policies oriented towards increasing agricultural production will reduce poverty levels. The essence of agricultural policy is the government's efforts and actions in regulating and controlling aspects of development in the agricultural sector to increase food production (Ikhsani et al., 2020).

The province of Aceh is one of the provinces with great potential in the agricultural sector, as reflected in agricultural exports, agricultural land area, and agricultural wages (Putri et al., 2023). However, there are still challenges in its implementation. One of the areas in Aceh Province that is prone to crop failure is West Aceh Regency. The decline in rice production is one of the obstacles faced by the local government. In 2023, rice production fell from 12,000 tons to 3,000 tons (Iskandar, 2023). This was due to drought and an irrigation system that was not yet optimal, which led to crop failure in several subdistricts in West Aceh Regency (Firmansyah, 2024). Inadequate infrastructure and pests are separate challenges in the agricultural sector. Crop failure will result in a decline in rice productivity within a certain period of time. The following is the rice production from 2020 to 2024 in the subdistricts of West Aceh Regency.

Table 1. Rice production volume by subdistrict

No	District	Rice Production				
		2020 (Tons)	2021 (Tons)	2022 (Tons)	2023 (Tons)	2024 (Tons)
1	Johan Pahlawan	3.926,7	5.087,3	4.995,36	3.546,18	2.739,1
2	Kaway XVI	31.225,4	20.640,3	18.873,56	15.433,7	20.158,1
3	Sungai Mas	2.261,5	2.481,9	1.488	1.333	1.324
4	Woyla	21.334,5	1.1324	11.266,2	6.924,1	11.535,54
5	Samatiga	16.186,5	12.934,7	13.274,38	8.046,3	11.305,04
6	Bubon	10.020,8	5.752,08	9.197,41	5.089,3	6.432,3
7	Arongan Lambalek	11.058,9	9.292	8.430,75	6.984,2	8.116,2
8	Pante Ceureumen	11.883,6	10.411,7	8.298,3	6.755,56	6.629,75
9	Meureubo	10.084	7.236	7.023,65	4.685,54	4.955,2
10	Woyla Barat	10.547,38	8.510,2	8.363,58	5.435,96	5.703,89
11	Woyla Timur	4.141,7	3.768,6	2.764,64	3.253,6	4.033,56
12	Panton Reu	4.778	5.281,6	4.183,7	3.775,2	4.477,88

Source: data.acehbaratkab.go.id processed by researchers

Based on Table 1, Kaway XVI Subdistrict is the subdistrict with the highest rice production in West Aceh Regency. Meanwhile, Sungai Mas is the subdistrict with the lowest production. In general, rice production is influenced by the size of the rice field area. Rice production in the 2020-2024 period is fluctuating. Looking at the 2021-2023 period, there has been a decline in rice production, particularly in Kaway XVI District. Based on observations, Kaway XVI District is prone to crop failure despite being recorded as the largest rice-producing district in West Aceh.

The downward trend in rice production will have an impact on food security. In line with the rice production data, the following is the Food Security Index (FSI) data for West Aceh Regency. The food security index is one of the indicators used to generate a composite score related to food security in a region (Food Security Agency, 2020). Based on the data presented in Table 2, the FSI value for West Aceh is fluctuating. The FSI ranking shows that the position of West Aceh Regency nationally declined in the period 2020-2022, while in 2023 the ranking of West Aceh Regency increased again. Regarding food availability, West Aceh Regency is classified as good even though the food availability value is fluctuating. According to Setiartiti (2021), a lack of food availability will have an impact on a decline in welfare, vulnerability to disease, and an increase in hunger. Food security is highly dependent on the availability of rice

production. One of the food-insecure areas in West Aceh Regency is Kaway XVI District (Pemerintah Kabupaten Aceh Barat, 2024). The problems of crop failure and food insecurity are a shared responsibility, with each element playing its own role in creating food security in West Aceh District. Therefore, the concept of synergy and collaboration is one of the efforts to address these issues.

Table 2. FSI of West Aceh Regency

National Ranking	Regency	Availability Index	Affordability Index	Utilization Index	Food Security Index	Year
165	West Aceh	86,98	74,73	75,25	78,61	2020
173	West Aceh	90,39	71,31	73,67	77,98	2021
184	West Aceh	90,57	68,93	74,28	77,56	2022
159	West Aceh	90,06	73,49	77,21	79,95	2023

Source: National Food Agency, processed by researchers

Research on agricultural policy in food security has been widely conducted. In general, the emphasis on the pentahelix approach is minimal, making it one of the distinguishing features from previous studies. The following are studies that discuss agricultural policy. (Setyaningsih, 2020 ; Ahmed & Siwar, 2013) study describes that one form of food security policy can be seen from food self-sufficiency, starting from the household to the national level, as well as food security that is able to compete in the future, thus requiring an active government that is responsive to food security issues. The next study, by Rachmawati (2020), shows that the implementation of smart agriculture in Indonesia has its own challenges, such as low farmer education and conventional cultivation patterns. However, the Ministry of Agriculture can still realize smart agriculture by involving various stakeholders such as start-up companies, the private sector, and state-owned enterprises to apply technology, as well as involving universities to regenerate young farmers. Heryadi (2022) research explains that in order to succeed in a sustainable organic rice agribusiness program, synergistic roles are needed from stakeholders through a pentahelix approach, the roles of various stakeholders, and common goals using resources to support innovation objectives. Collaboration between stakeholders through partnerships and synergy will ensure that the goal of sustainable organic rice agribusiness can be achieved. Research by Anwar & Aprilianisa (2023) shows that large-scale food development in the Food Estate program requires the availability of supporting infrastructure, including irrigation, roads, and production facilities. There is a collaborative role between internal and external stakeholders in the food estate policy process. A supporting factor in the food estate program is the availability of vast agricultural land. An obstacle in the implementation of these activities is that the nomenclature for the implementation of the food estate is still being drafted. Research by Mardhiah (2024)describes that the synergy of rice farming management policies has not been optimally integrated at the local government level. This is due to the dynamics of policy and the position of customary law, which is still viewed as superficial by the government. Thus, the government can formalize inclusive policies for customary institutions to improve agricultural governance and support poverty alleviation efforts.

From several previous studies, there are differences in focus with the researcher's study. Thus, it becomes a distinguishing value in the study. Previous studies looked at agriculture from a massive perspective, through the boundaries of agricultural programs such as food estates, did not explicitly discuss the pentahelix concept, and predominantly used literature review, qualitative, and descriptive methods. One of the previous studies that used the pentahelix approach also did not specifically highlight local government but focused on exploring the development of an implementation model in the context of sustainable organic rice agribusiness. In addition, this study focused on the pentahelix concept by looking at the

roles of various actors in efforts to strengthen regional food security as a form of crop failure prevention. Thus, this study offers a novel aspect in the form of applying the pentahelix concept in the context of regional food policy. The theoretical contribution can expand and enrich the application of the pentahelix concept by adding a focus on crop failure, agrarian risks, and regional food security in the collaborative concept. Meanwhile, the practical contribution through the research results serves as a guide for the government in strengthening the collaborative concept. Explicitly, there are two major frameworks that bridge this research, namely the pentahelix or collaboration concept and food security. These frameworks describe how cross-actor interactions strengthen regional food security in West Aceh Regency.

The relevant approach used to address the issues in this study is through the collaborative pentahelix concept, which involves various internal and external elements. The development of the pentahelix model began in 2015 as a guideline for building synergy between relevant institutions to support optimization in achieving objectives (Soemaryani, 2016). According to (Azzahra et al., 2024), the pentahelix concept is a method used to address public issues and develop programs with a cross-sector collaboration concept with various roles. The Pentahelix model, which emphasizes collaboration between the government, academics, the private sector, the community/farmers, and the media, is a form of innovative governance that illustrates how multi-actor networks interact in the public policy space (Natalis et al., 2025; Panjaitan et al., 2024; Sukri et al., 2023). This is in line with the concept (Rhodes, 1997) which states that modern government is no longer run hierarchically, but through policy networks built on trust, negotiation, and inter-agency coordination. In the context of agricultural policy for regional food security, the pentahelix expands on Rhodes' idea by emphasizing the importance of relationships between actors: the government as a facilitator of regulation (Prasetyo et al., 2023; Pratiwi et al., 2025), universities as sources of knowledge (Setyo et al., 2025; Subair et al., 2025) the private sector as drivers of the economy and technology (Subagyo, 2021), the community/farmers as the main actors at the field level (Nalikan & Rozikin, 2024), and the media as agents of public communication that maintain transparency and social participation (Nalikan & Rozikin, 2024). Thus, regional food governance is the result of horizontal interaction, not merely a product of vertical bureaucratic decisions.

This concept is further strengthened when linked to the Collaborative Governance framework (Ansell & Gash, 2008) and the integrative model (Emerson et al., 2012), which emphasize that cross-actor collaboration requires equal starting conditions, inclusive institutional design, facilitative leadership capable of mediating interests, and transparent communication processes leading to joint outcomes. When these principles are applied in the agricultural pentahelix, a collaborative and adaptive policy ecosystem is formed. This model is also rooted in the innovation helix framework (Etzkowitz & Leydesdorff, 2000) and (Carayannis & Campbell, 2011), which places the synergy of knowledge, industry, government, society, and the environment as drivers of sustainable development transformation. The integration of the pentahelix, Rhodes, Ansell & Gash with the innovation helix approach shows that the success of regional food security is determined by the capacity of social networks, the quality of interactions between actors, and the sustainability of the policy learning process. Ansell and Gash's collaborative governance framework can be seen as follows:

From Figure 1, there are five stages in the Collaborative Governance framework process model presented by Ansell and Gash, including:

a. Starting Condition: a stage that discusses two important issues, namely resource imbalance and incentives as an effort to participate.
b. Facilitative Leadership: facilitating leadership. This means that in the collaboration process, the leadership spirit of each actor is needed.

c. Institutional Design: there are rules in the implementation of collaboration that are open in nature.
d. Collaborative Process: the collaboration stage begins with a face-to-face consensus dialogue forum with the aim of building trust across actors so that they have a common understanding.
e. Intermediate Outcomes: collaboration is considered successful if the process that has been implemented is carried out jointly and continuously. (Noor et al., 2022)

Based on data on rice production and the FSI of West Aceh Regency, the research question is: what form does pentahelix collaboration take in the implementation of agricultural policies for food security in West Aceh Regency? The purpose of this study is to provide an understanding of the form of cross-sector pentahelix collaboration in the implementation of agricultural policies for food security in areas prone to crop failure. It also aims to identify the factors that support the success and failure of pentahelix actor collaboration in promoting food security and to analyze the contribution of pentahelix to the effectiveness of agricultural policy implementation in dealing with crop failure.

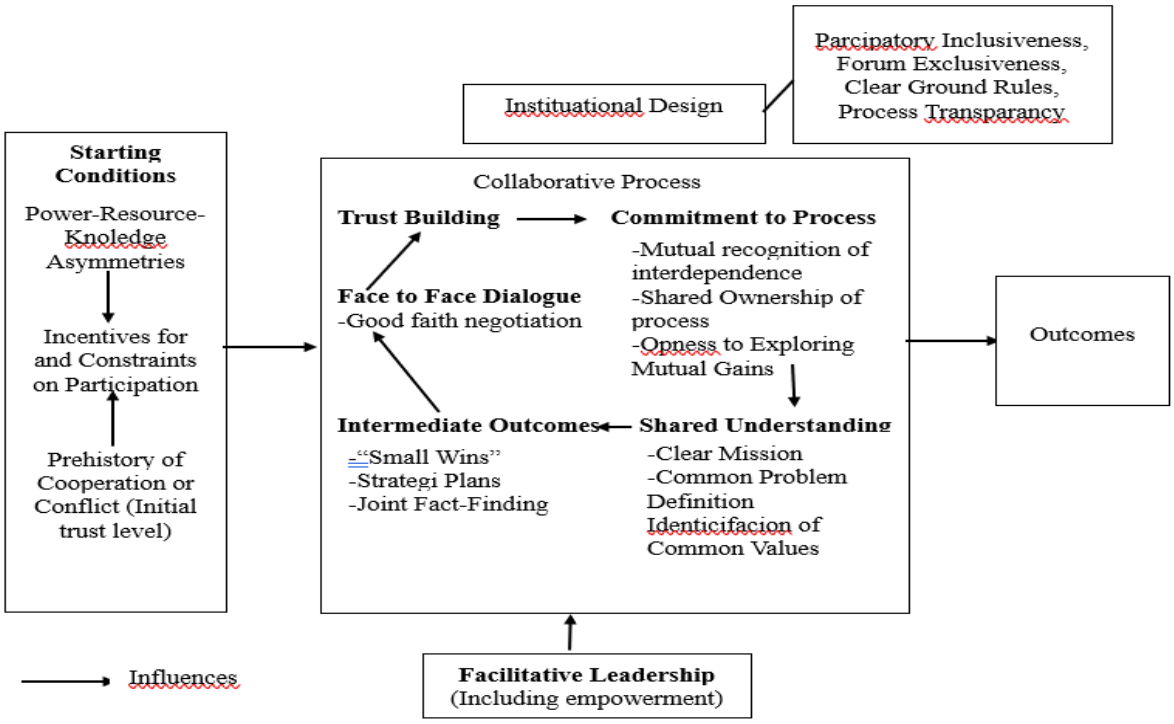

Figure 1. Collaborative Governance Framework
Source: Ansell and Gash in (Noor et al., 2022)

METHODOLOGY

The design used in this study employs a qualitative research method with a case study approach. Qualitative methods can be defined as a research process based on observations of a situation using approaches and data that produce descriptive analyses through verbal statements obtained from the research subjects (Sahir, 2021). According to Kusumastuti & Khoiron (2019), the case study approach is a research strategy that focuses on carefully investigating a program, event, process, activity, or group of individuals. Similarly, Hermawan & Hariyanto (2022) state that this type of research examines humans (whether in the form of an organization, individual, or group), events, and detailed backgrounds. The implicit objective of case study research is to obtain detailed information about a problem that will occur or is currently occurring. The research was conducted in West Aceh Regency, which is identified as one of the areas prone to crop failure, by examining the implementation of pentahelix

collaboration and the supporting and inhibiting factors in food security. The reason for choosing West Aceh Regency is because there are still central sub-districts that produce rice, which have experienced a decline in rice production and are prone to crop failure, while the infrastructure is already supported by irrigation. Therefore, it is interesting to study further the implementation of agricultural policies in regional food security. The list of informants can be seen in Table 3. There were 10 informants in this study, selected through purposive sampling and accidental sampling. According to (Sahir, 2021), purposive sampling is a technique or method used to determine informants based on certain considerations. In another definition, purposive sampling is a technique to facilitate sample selection based on certain considerations so as to facilitate the achievement of a goal (Fadjarajani et al., 2020). Meanwhile, accidental sampling is a technique of taking samples based on ease of access or availability of subjects (Subhaktiyasa, 2024).

Table 3. List of Research Informants

No	Category	Informant	position	Techniques for Determining Informants
1	Local Government	1. West Aceh Food Crops and Horticulture Agency	Head of department	Purposive
		2. West Aceh Regency Food Agency	Head of Department/Secretary	Purposive
		3. West Aceh Regency Office of Trade, Industry, Cooperatives, and Small and Medium Enterprises	Head of Department/Head of Division/Head of Section for Trade	Purposive
		4. Kaway XVI Subdistrict Agricultural Extension Center	Agricultural Extension Officer	Purposive
		5. Subdistricts and villages affected by crop failure	Head of Kaway XVI Subdistrict and Head of Alue On Village	Accidental
2	Academics	Researcher	Agriculture Lecturer	Purposive
3	Businesses	Industry	Owner of a Rice Mill Business	Purposive
4	Community	Local Farmers	Farmers	Accidental
5	Media	Local publication media	Journalist	Accidental

Source: compiled by researchers

Data collection techniques were obtained through observation, secondary and primary data. Systematic observation was carried out from the outset to determine the patterns of interrelationships between the stakeholders involved. These were then analyzed based on the pentahelix collaborative concept. Primary data consists of in-depth interviews conducted with two or more people to obtain information on the issues being studied. In-depth interviews can also be interpreted as a qualitative research technique used when conducting detailed interviews with a limited number of participants (Rutledge & Hogg, 2020). Furthermore, the steps used to deepen information about the factors of success and failure in cross-sector coordination were carried out using unstructured interviews to obtain exploratory results. After the data collection process, the next stage is data analysis. By definition, data analysis is defined as the process of converting the data obtained into meaningful information. Data analysis aims to assist researchers in connecting various information, processing data, and drawing conclusions(Taherdoost, 2022). To ensure data credibility, a triangulation system is needed. According to Sugiyono (2009), credibility testing can be interpreted as checking data from various sources in various ways and at various times, thus resulting in source triangulation, data collection technique triangulation, and time triangulation.

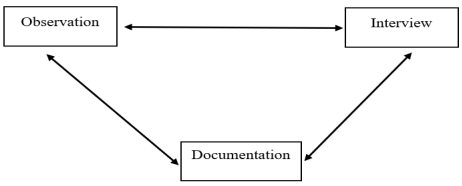

Figure 2. Triangulation of Data Collection Techniques

The data analysis techniques used in this study adopt the theory of Miles and Huberman in Fadjarajani (2020), which includes: Data Collection, Data Display, Data Condensation, and Conclusions.

1. Data Collection is defined as the process of organizing, refining, directing, classifying, and eliminating inappropriate data so that it can be verified.
2. Data Display is the process of compiling the information that has been obtained so that conclusions can be drawn. Data can be presented in the form of charts, flowcharts, brief descriptions, and others.
3. Data Condensation is the simplification, focusing, and structured transformation of field data, conducting transcription of interviews, documents, and empirical data in other forms.
4. Conclusions are the process of drawing preliminary conclusions and then verifying them. Valid conclusions are based on evidence and consistent with the data found in the field, which is then processed as part of the verification, thereby ensuring the credibility of the research results. (Fadjarajani et al., 2020).

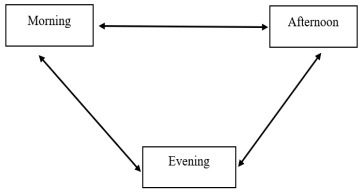

Figure 3. Triangulation of Data Collection Time

RESULTS AND DISCUSSION

The essence of the research results discusses the form of pentahelix collaboration, supporting and inhibiting factors of collaboration, and the contribution of the effectiveness of the pentahelix concept in the implementation of agricultural policies for regional food security in West Aceh district.

Forms of collaboration between pentahelix actors in the implementation of agricultural policies in West Aceh Regency

The form of collaboration in implementing agricultural policies for food security in West Aceh Regency can be seen from the roles of actors through the pentahelix elements. The government elements involved in food security consist of cross-agency government institutions at both the local and central levels. This is in accordance with what was stated by the Head of the Agriculture Office, Safrizal. He stated:

> *"Those involved in implementing agricultural policies related to food security begin with the agricultural agency itself, as this agency plays a role in the production sector. After production, the process continues to the food agency, trade agency, Bulog, PUPR, transportation, regional leadership coordination forum (Forkopimda) elements, the regent, the Indonesian National Armed Forces, the police chief, the prosecutor's office, and others" (Interview, August 7, 2025).*

A similar sentiment was expressed by Diana Verawati, Secretary of the West Aceh District Food Agency:

> *"When it comes to collaboration and coordination, coordination already exists, with TPID meetings held every Monday at the regent's office. The agencies involved are those related to inflation. Those involved are generally the food, agriculture, trade, livestock, and fisheries agencies. The TPID also includes the Indonesian National Armed Forces, the police, and transportation agencies for access issues, while the BPKD handles the budget and all agricultural groups are involved." (Interview, August 11, 2025)*

Each government agency has its own role in food security. The West Aceh Food Crops and Horticulture Agency plays a role in food security, particularly in the production of rice. The Food Agency acts as a food price controller, food subsidy administrator, and food distribution supervisor. The West Aceh Trade, Industry, Cooperatives, and SMEs Agency acts as a supervisor and distributor of food stocks through cheap markets. This is as explained by the Secretary of the Food Agency and the Head of Trade at the West Aceh District Trade, Industry, Cooperatives, and SMEs Agency:

> *"In our current implementation, we are involved in rice production. If there is not enough supply, we cut prices. If there is insufficient supply of rice and prices rise, we cut prices with the help of regional funds by providing subsidies such as cheap food. The trade office goes directly to the market. If we are outside the market, before entering the market we have already cut prices with transportation cost subsidies so that food prices do not increase due to decreased supply. In other words, we are the ones who bring the goods in." (Interview, August 11, 2025)*
> *"The role of disperindakgop. In our activities so far related to food security, we have only monitored staple foods, monitored goods, monitored stock, and reported daily to the Ministry of Trade headquarters. When it comes to food, we coordinate activities such as cheap markets." (Interview, August 12, 2025)*

Based on the above description, the role of the government in the context of collaboration is more to implement and regulate food-related regulations and policies, facilitate the Regional Inflation Control Team (TPID) forum, provide subsidies (transportation costs, cheap food), ensure infrastructure and access to food distribution, and provide educational activities to the community related to agriculture. This is in line with Febrianty's (2024) view that the government acts as a regulator, planner, implementer, facilitator, and supervisor of policies.

The next actor involved in the pentahelix element is academics. The role of academics focuses on research and dissemination related to food security through collaborative activities both at the village level and with the West Aceh Regency government. Activities that have been carried out include mentoring villages in the concept of downstreaming food products and thematic research collaboration between UTU and the West Aceh Regional Development Planning Agency (Bappeda). This is in line with what was conveyed by Mustafa Kamal, a lecturer in Agricultural Product Technology:

> *"So in 2024, we will have community service activities with the village government in Suak Ribe related to food security and the downstreaming of moringa leaf products so that they can be made into noodles and cakes. Furthermore, in 2024, with Bapeda, there will also be activities not with study programs but with individuals related to data collection on leading*

commodities in West Aceh, a grant from Bappeda. In 2024, there will be assistance with the slaughter of halal sacrificial animals in Seuneubok. Furthermore, lecturers will provide assistance with a Bima grant related to the cultivation of sorkum, a type of wheat. Then, the program has a memorandum of understanding (MOU) with partner villages such as Suak Ribe Senebok and Meurebo. The partnership takes the form of, for example, P2MW, PPK Ormawa. We have more direct contact with the village-level government because some food-related activities are carried out at the village level. However, with Bappeda, there are several other lecturers who are implementing projects. And the cooperation is going very well. The themes implemented are also related to food security" (Interview, August 13, 2025)

Specifically, academics play a role in providing information to the government through research results. Thus, through research, academics can provide policy recommendations to the government in addressing food security issues. This collaboration can have a positive impact on both parties. In addition to research, activities based on the concept of empowerment are a form of community service that has been implemented, such as the downstreaming of food security products.

The next pillar in the context of collaboration is business actors. The involvement of business actors or industry in agricultural policies for food security in West Aceh can be seen from the cooperation carried out with the Meulaboh Branch of Bulog in the form of rice milling. This is in line with what was conveyed by Januar, the owner of a rice mill and entrepreneur:

"*Our company partners with Bulog only in the form of milling wages. This cooperation has only been implemented once and is still ongoing because it is a new program. The cooperation is based on an MOU and contract in the form of a fixed amount of rice per milling. We can mill around 28 tons per day at maximum capacity. The fee scheme is calculated per kilogram of rice milled, processed into rice, and delivered to Bulog. The rice is supplied by distributors appointed by Bulog. We do not purchase the rice; we only mill it. After milling, we pack and deliver it back to Bulog. Bulog simply receives the finished product." (Interview, August 14, 2025)*

The collaboration between the company and the government is carried out based on a rice milling and distribution contract agreed upon by both parties. The role and form of collaboration between the company and the government is more like a working partnership. The company participates in helping small farmers with loans that are converted into seeds and fertilizers to produce high-quality rice. Explicitly, companies maintain the sustainability of supply based on the processing and delivery process to Bulog.

The next dimension in the pentahelix is the media. The role of journalists in general is as distributors or disseminators of news (Widiastuti, 2019). The context of media collaboration in food security activities is as conveyors of information, monitoring activities through the information presented. This description is in line with what was conveyed by Rizwan, a member of the press:

"The government often involves the press because if it is not involved, the activities carried out will not be communicated, even though the activities are large-scale, without the media, they will not be complete. The involvement is not as an implementer but as a conveyor of information. The position, if you say it is a partner, can be a partner; if you say it is a guardian, it can also be

> *a guardian; we say that as a disseminator of information, it can also be a function of the press as regulated by law" (Interview, August 12, 2025).*

The media plays a role in informing or conveying information. So far, especially in West Aceh, there have been many government activities related to food security that have been covered and published, such as the rice harvest. In addition, the media acts as a controller or supervisor of government activities through the data and information it presents.

The final dimension in the pentahelix is the community. The community in this study is farmers. Farmers are the spearhead or main actors in food agriculture (Konyep, 2021). The involvement of farmers in the concept of collaboration can be seen from the efforts of farmers to produce. This description is in accordance with what was conveyed by Z (initials) as a rice farmer in Kaway XVI District:

> *"Farmers' involvement in decision-making usually involves communicating with the head of the farmer group about what is needed. For example, water requirements or when to start planting are decided together. Those involved in assisting farmers are usually government officials, namely extension workers from BPP Kaway XVI. Farmer involvement is very significant because farmers are the ones who produce rice. Of course, farmers also have limitations in agriculture, so they need support from the government" (Interview, August 14, 2025).*

Collaboration between farmers and the government takes the form of assistance activities carried out by the Agricultural Extension Center. Every village in Kaway XVI Subdistrict has an agricultural extension worker. Farmers interact directly with agricultural extension workers. Farmers can convey obstacles or developments in the agricultural process, from processing and planting to harvesting. However, farmer forums attended by extension workers are rarely held.

Based on the above description, the pentahelix collaboration in the implementation of agricultural policies for food security in West Aceh Regency can be seen in Figure 4.

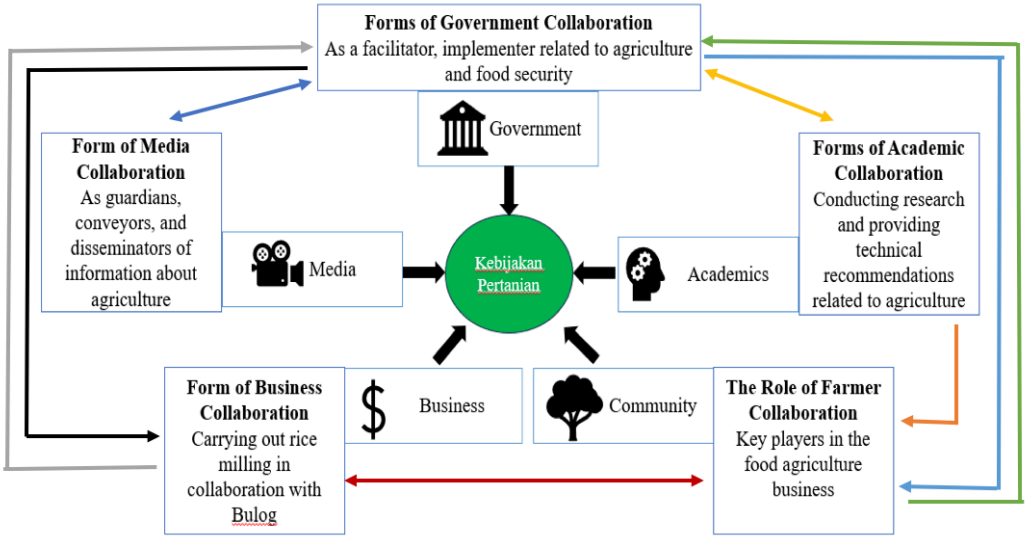

Figure 4. Pentahelix Collaboration in Agricultural Policy Implementation
Source: processed by researchers

Pentahelix collaboration in the implementation of agricultural policies for food security can be traced from the elements A-B-C-G-M (Academician, Business, Community, Government, Media). The involvement of each element as an actor emphasizes the roles and contributions that have a mutual impact on each element. Broadly speaking, the government

has a role as a facilitator and implementer of agricultural food policies. In the context of agriculture, from production to food distribution, the government is responsible for regulation, facilitating infrastructure to support sustainable food security, and carrying out management functions in the form of cross-sector coordination to control regional inflation. Increasing food commodity production is part of controlling regional inflation (Yunita, 2024). As a policy maker, the government cooperates with business actors through the Meulaboh Branch of Bulog. This cooperation is carried out based on a rice milling contract agreement between Bulog and rice milling entrepreneurs.

The cooperation scheme is based on the amount of rice milling, with the rice milling factory having the capacity to produce around twenty-eight tons of rice per day. The involvement of partners is limited to rice milling. The form of collaboration between the government and business partners is very limited. To support the achievement of food security, the government can expand the form of cooperation with business actors. This will have an optimal impact on food security. Another actor involved in food agriculture policy is academics. The form of collaboration carried out by academics can be seen from the three pillars of higher education, namely education, research, and community service. The research pillar is carried out by conducting and producing research on agricultural policy and food security. The results of the research are submitted to the government through the West Aceh District Development Planning Agency (Bappeda) to be used as recommendations for the government in making policies, especially in the context of agriculture. Academics and Bappeda Aceh Barat also carry out thematic research collaboration activities for regional development, with food security being one of the focuses of the research. The pillar of community service has been implemented in several villages in Aceh Barat Regency, such as a program to process moringa leaves into noodles and cakes. Then there is the community service program with the assisted villages. In terms of implementation, collaboration with the government has been carried out at both the West Aceh Regency Government and village levels in the West Aceh region in the context of agricultural policy. Apart from academics, the next actors involved are the media.

The media has a role as a conveyor and disseminator of agricultural policy information through news reports. The dissemination of information can build transparency in the implementation of agricultural policies, educate the public, and serve as a channel of communication between the government, farmers, non-governmental organizations, and the wider public. In addition, the media plays a role as a watchdog in the implementation of agricultural policies through the information it conveys to the public. The form of collaboration from the media emphasizes the implementation of the press function. The last element in the pentahelix concept is the community. Farmers are at the forefront of agricultural policy implementation because they are the ones who produce agricultural commodities. In practice, farmer involvement is still not optimal, as can be seen from the decline in rice productivity, the lack of simultaneous rice planting, and the absence of an official customary institution that represents farmers, because farmers have been working independently. The policy that has been very supportive of farmers is the increase in grain prices, which can increase farmers' motivation in agriculture, especially rice farming.

In summary, the following is a presentation of cross-actor collaboration in the implementation of agricultural policies in food security. From the perspective of power dynamics, the government plays a dominant role, but the roles of other actors need to be strengthened so that collaboration can be optimized. This is in line with the views of Ansell and Gash. Collaboration is considered successful when activities are carried out jointly (Noor et al., 2022). This means that from the planning, implementation, and evaluation processes, each actor must work together according to their respective roles. Furthermore, there is an exchange of capital, information, and legitimacy, thereby forming a symbiotic relationship

between cross-actors. Next is the dimension of trust building, where the direction of pentahelix collaboration is to improve the principles of good governance.

Table 4. Cross-actor pentahelix collaboration

Actor	Main Role	Collaborative Relationships	Resource Exchange	Power Dynamics	Trust Building
Government	Regulator, Implemntator, Policy Facilitator	Formulating policies, implementing cooperation	Regulations	As a policy maker, you can determine the direction of policy.	Participation, Transparency, and Accountability
Academics	Conveying knowledge, analyzing policies, providing policy recommendations	Providing recommendations to the government and the public based on research results	Research data, community training	Scientific legitimacy	Research publications
Business	Rice availability balancer	Working with farmers and the National Logistics Agency (Bulog) in the rice supply chain	Facilities and infrastructure resources	Having an influence in economic matters	Sustainability and certainty through cooperation agreements
Community	The spearhead or main actor in rice production	Collaborating with the government in improving agricultural capacity and rice sales	Labor force, local wisdom	In line with government policy	Increased participation and two-way communication, training
Media	Public information channel (information dissemination), monitoring.	Conveying information related to agriculture in accordance with the function of the press.	Public information	Shaping public opinion	Transparency, credibility

Source: compiled by researchers

Supporting and Inhibiting Factors of Pentahelix Collaboration

Pentahelix collaboration in food security in West Aceh faces its own challenges in its implementation. There are various factors that influence and hinder the implementation of pentahelix collaboration in agricultural policies for regional food security. One of the factors supporting the implementation of pentahelix collaboration is effective communication. The implementation process of pentahelix collaboration is supported by open communication channels between government actors, which facilitates coordination in problem solving. The Head of the Agriculture Office, Safrizal, expressed a similar view, as follows:

> *"One factor that supports collaboration between sectors is effective communication. If there is a problem, for example in agriculture, with roads, irrigation, or infrastructure, I immediately call the head of the relevant agency so that it can be dealt with promptly. We are no longer working independently; we are now integrated. For example, we observe and monitor commodity prices that are rising, so that the food agency, based on information from the agriculture agency, can work with the national logistics agency or other regions to supply goods." (Interview, August 7, 2025)*

Coordination is one of the management functions in the process of achieving objectives. The essence of collaboration is to carry out coordination so that program activities can be implemented effectively. The next influencing factor is the support of regional leadership. Regional leaders understand agricultural issues, thereby supporting and directing collaboration to be more focused through strengthening production, affordable market policies, and CSR

programs. The role of academics is a supporting factor, as they produce recommendations that serve as guidelines or references for policy-making and innovation in the agricultural sector. Furthermore, regular monitoring and evaluation by the government through the Regional Inflation Control Team and field visits by agencies are forms of direct supervision aimed at achieving food security.

The factors that hinder the implementation of pentahelix collaboration in food security are the absence of detailed and clear technical regulations in the implementation of pentahelix collaboration. The next factor is that limited regional budgets can hinder program implementation, even though there are efforts to maximize special autonomy funds or CSR. Social jealousy among farmers and uneven distribution of assistance among farmer groups or villages can cause dissatisfaction, thereby affecting the spirit of collaboration. This is reinforced by the statement of Deki, an agricultural extension worker in Kaway XVI Subdistrict:

> *"The obstacle faced by BPP in providing guidance is that some communities are stubborn, for example, if assistance is only given to one group. Why can't other groups or villages receive it? Social jealousy." (Interview, August 14, 2025)*

Limited government budgets can have an impact on the community, as government assistance is not evenly distributed, causing social jealousy. Another weakness is that the government does not consider quality when purchasing grain. This is based on central government instructions regarding the purchase price of grain at around 6500/kg (six thousand five hundred) per kilogram. As a result, when the rice is milled, the quality of the rice produced is poor. Sorting should be carried out first to produce high-quality rice. The scope of action for business actors as partners in food security is very limited in the form of rice milling cooperation. They should be involved in other forms, such as purchasing grain at prices set by the government and directly supervised by the government. The next obstacle is that not all of the results of research conducted by academics are adopted by the government in formulating policies. In public policy, the task of policy analysis is to produce policy recommendations, while the government's task is to formulate policies based on the input or policy recommendations that have been submitted. This is reinforced by the results of Mardhiah's (2024) research, which found that the synergy of rice farming governance policies has not been optimally integrated in local government.

The Contribution of Pentahelix to the Effectiveness of Agricultural Policy Implementation for Food Security in West Aceh

The pentahelix concept involves the government, academics, business actors, farmers, and the media. In general, it can contribute to improving the effectiveness of agricultural policy implementation for food security in West Aceh. Implementation using a cross-actor collaboration approach is part of preventive efforts to reduce the risk of crop failure through rapid coordination functions such as infrastructure improvements, simultaneous planting, extension support, academic research, and the provision of subsidies. These activities are activities that can be carried out based on coordination functions. This is in line with what was conveyed by the Head of the West Aceh Agriculture Office, Safrizal:

> *"In terms of collaboration, the impact of crop failure has been minimized. For example, once it has been entered into the team's database, the transportation department immediately takes action to fix the poor infrastructure. In the past, we worked independently, but now it is much easier because we are integrated and connected with each other. If there are obstacles on the road, we can call*

and ask for them to be removed so that access to agricultural areas is easier. Collaboration brings enormous benefits." (Interview, August 7, 2025)

In terms of food availability, the pentahelix seeks to increase production and supply chain efficiency, so that farmers can access affordable markets through the Rp. 6,500 grain price set by the government through Bulog. This description is in line with what was conveyed by the Secretary of the Food Agency, Diana:

"Before the collaboration, harvests were not well managed. For example, after the harvest season, distributors would buy rice from farmers at low prices. But now, thanks to the collaboration, Bulog will purchase farmers' rice at prices set by the government." (Interview, August 11, 2025)

The increase in the purchase price of unhusked rice has boosted farmers' enthusiasm to contribute to rice production in West Aceh. The increase in the purchase price by the government through Bulog has provided economic benefits to the community, especially farmers. Indicators of effectiveness in the implementation of agricultural policies for food security can be described through the achievement of rice self-sufficiency in West Aceh, the stability of staple food prices, and the implementation of collaborative programs including simultaneous planting, cheap food movements, and cheap markets carried out by the government.

The contribution of academics through the three pillars of higher education, especially the research pillar, can strengthen decision-making and policy evaluation based on evidence-based recommendations through research results. Thus, the results of the research can be utilized by the government and farmers. In general, the pentahelix is not limited to efforts to strengthen food security that are carried out technically, but also touches on inclusive and participatory governance development that adheres to the principles of sustainability in the agricultural sector in West Aceh. However, in practice, there are still areas prone to food insecurity and crop failure in West Aceh. Nevertheless, through the pentahelix concept, the potential for crop failure and food insecurity can be reduced.

CONCLUSION

The implementation of agricultural policies for regional food security based on the pentahelix approach in West Aceh can be seen through collaboration. The government, as the implementer, synergizes and collaborates with academics, business actors, farmers, and the media in an effort to improve food agriculture through the respective roles of each actor. The essence of the pentahelix is to carry out a coordinating function in food agriculture policy. The weakness of implementing agricultural policies through the pentahelix approach is the absence of specific regulations, such as standard operating procedures that regulate the specific flow of collaboration across actors. The government has its own forum, such as the Regional Inflation Control Team. In essence, this forum also discusses food issues because food is closely related to inflation. The involvement of all actors in the same forum does not yet exist. So far, the coordination process has been separate and direct between the government and academics, the media, farmers, and business actors. The implementation of the pentahelix approach in agricultural policy for food security is, in general, a preventive effort to reduce the risk of crop failure and food insecurity in West Aceh. Although the collaborative concept has been implemented, crop failure and food insecurity are still found in several villages in West Aceh, albeit on a small scale. One of the factors contributing to crop failure is water scarcity. The irrigation network, as part of the infrastructure, is not yet operating optimally, which poses an obstacle for farmers. An alternative solution to this problem is to use water pumps or dabs

connected to rivers or forests. The practical contribution of this theory is to realize concrete synergy across actors. Thus, food security is not only limited to production but also to aspects of governance, distribution, and participation from each actor.

There are institutional challenges in implementing pentahelix collaboration in the agricultural sector in West Aceh. First, there are no regulations or local ordinances governing the mechanism for collaboration between actors consisting of the government, academics, business actors, farmers, and the media. As a result, non-governmental elements operate independently according to their respective roles. The weakness of not having regulations has an impact on the sustainability of collaboration programs, which are difficult to implement in the future. This is due to political factors, as officials will change in the future. This reason is one of the important factors for strengthening and binding the concept of collaboration with regulations. This situation is contrary to the concept of collaborative governance presented by Ansell and Gash in (Noor et al., 2022), where one of the stages in the concept of collaboration is marked by institutional design. Institutional design is characterized by the existence of rules in the implementation of open collaboration. This means that the collaboration mechanism is implemented based on standard operating procedures. Second, there is an imbalance in the roles of cross-actors, with collaboration centered on the government through its role because it is supported by resources. Meanwhile, other cross-actors tend to be complementary.

Research using the pentahelix concept has limitations in comprehensively measuring effectiveness due to the varying interests of cross-actors. Each actor has its own direction, objectives, and indicators in assessing the success of the agricultural sector. The government looks at program achievement, academics emphasize scientific validity, business actors are oriented towards financial gain, farmers prioritize economic benefits, and the media focuses more on the function of the press. Therefore, to address these issues, an integrative approach using mixed methods is needed to describe the complexity of the pentahelix concept specifically in further research.

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