Structural model design of the role of institutions in the development of cayenne agribusiness systems

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Abstract. The strategy of developing sustainable vegetable commodity in the future is not only directed at efforts to develop production in accordance with needs but strengthening institutional farmers is an important part to consider. The study aims to design a structural model of the role of institutions in the development of cayenne agribusiness systems. The study was conducted in Tarakan City, North Kalimantan as a small island of border area. Data collection is done by qualitative method. Interpretative Structural Modeling (ISM) data analysis techniques is used to analyze data or information about institutions that play a role in the development of cayenne agribusiness systems and structural models of the role of institutions in developing cayenne agribusiness systems. The results showed that, the structural model of the institution's role in the development of the cayenne agribusiness system is based on key actors including the cooperative and SMEs, and the agricultural technology assessment center.

1. Introduction
The main problem in the development of cayenne agribusiness is not yet realized the variety, quality, continuity of supply, and quantity in accordance with market demand, especially for the purposes of modern markets (supermarkets/hypermarkets), processing industries, institutional consumers (hotels, restaurants, hospitals), and export market. Lack of coordination between agribusiness actors is one of the causes of these problems [1]. This causes the institutional structure of cayenne commodity agribusiness to be fragile and the linkage of supply chain management to be weak so that the competitiveness of cayenne commodities becomes weak [2] including agrarian land conflict [3].

The weak competitiveness of cayenne commodities is a challenge in the implementation of agricultural development in the future, so there is a need for a strategy to improve the competitiveness of cayenne commodities in order to compete in the domestic and export markets. The future strategy of agribusiness development of sustainable vegetable commodities is directed at efforts to develop production in accordance with needs, creating evenly distributed cropping patterns throughout the year, increasing
competitiveness and capability of Human Resources (HR), strengthening farmer institutions, capital, and marketing, and optimizing land use and facilities and infrastructure [4].

Tarakan City is the region that is located closest to the Malaysian border area. Based on Presidential Regulation No. 7/2005 concerning the National Medium-Term Development Plan (RPJMN 2015-2019), the development of the country's border region has been established as one of the national development priority programs. One of the sectors that can be developed to support the National Medium-Term Development is the development of the horticulture sub-sector [5].

The Directorate General of Horticulture received a mandate from the Ministry of Agriculture in order to increase cayenne production in an effort to maintain the availability and supply for inflation control and price stabilization as well as to increase the production of horticultural leading commodities [6]. Cayenne is a horticulture plant that is widely cultivated by Tarakan City farmers. In 2017 the production of cayenne amounted to 1,029 tons with a planting area of 100 ha and a harvest area of 98 ha and each year experienced a significant increase until in 2017 the production of cayenne in Tarakan City was 1,598.7 tons with a planting area of 156 ha and a harvest area of 154 ha as well as having a large influence on inflation and food price stability in the City of Tarakan [7].

Through the Food Crop Service and related institutions are expected to be able to overcome the problems faced by farmers in the cayenne agribusiness system such as (1) limited skilled labor, (2) limitations in applying technology, (3) post-harvest activities and market competition, (4) limitations venture capital and (5) the optimization of the institutional system for cayenne farmers in the city of Tarakan can be overcome [8]. The institutional approach which includes three pillars including regulative pillars, normative pillars and cultural-cognitive pillars is expected to be able to encapsulate all thoughts that develop regarding institutions in the field of sociology and new institutions so that farmers make institutions as guidelines in carrying out their daily activities. In accordance with the systematic compiled, that through the approach of the three pillars, the regulative pillar of the object is the existing rules and "what benefits" the actor will gain in acting; the normative pillar of its object on living norms and agreed upon in the community; while the object in the cultural-cognitive pillar is in the form of cultural knowledge that is owned by individuals and society by using the perspective of the sociology of knowledge [9].

2. Methods
The research was conducted in Tarakan City, North Kalimantan, Indonesia. Data collection is done by qualitative method [10]. Qualitative data were collected by questionnaire and interview with informants. The study uses data analysis techniques of the Interpretative Structural Modeling (ISM) model to analyze data or information about institutions that play a role in the development of cayenne agribusiness systems in Tarakan City and structural models of the role of institutions in developing cayenne agribusiness systems in Tarakan City. The stages in the ISM analysis are (1) Arrange Structural Self-Interaction Matrix (SSIM) (2) Arrange the Reachability Matrix table, (3) Develop a structural model, and (4) Arranging Power Driver-Dependent (DP-D) Matrix [11].

3. Results and discussion
ISM analysis starts from identifying the institutions or related parties that have been identified based on the results of research in the field (table 1). As for the institutions listed are the institutions mentioned by respondents at the time of the interview.
Table 1. Institutions related to the development of cayenne agribusiness systems.

| Name of Institutions                          | Involvement | Role                  |
|----------------------------------------------|-------------|-----------------------|
| Farmer Group                                 | Involved    | Production            |
| Agricultural Extension Worker                | Involved    | Counseling and Training|
| Middleman                                    | Involved    | Marketing             |
| SMEs Sambal Dayak                           | Involved    | Derivative Products    |
| Department of Food and Horticulture Plants   | Involved    | Audience              |
| Department of Trade, Cooperatives and SMEs  | not involved yet | Audience             |
| Institute for Agricultural Technology Assessment | Been involved |                        |
| National Amil Zakat Agency                   | Involved    | Inflation Control      |

3.1. The role of institutions in the development of upstream subsystems

ISM analysis results on the institutional elements that play a role in the development of upstream subsystem is shows in figure 1.

Based on figure 1, it shows that sub-elements of Food Crops and Horticulture Office (E), the Agricultural Technology Assessment Center (I), the Bank Indonesia Representative Office (H) and the Farmers Group (A) are in sector IV (Independent: sub-elements have strong influence), each institution plays an important role in providing facilities and infrastructure to assist in the activities of cayenne farming. One of the efforts carried out is the procurement of tools and equipment such as water pumping machines and sprayers, as well as materials such as superior seeds and fertilizers. National Amil Zakat Agency (J) and Agricultural Extension Workers (B) are in the position of Linkage III sector (sub-elements...
must be studied carefully because the variables are unstable), because these institutions are easily influenced by the Department of the food crops and horticulture services and affect the provision of facilities and farming infrastructure received by cayenne farmers in Tarakan City. The Department of Trade, Cooperatives and SMEs (F), Brokers (C), Bank Rakyat Indonesia (K), and SMEs Sambal Dayak (D) are in sector II (Dependent: sub-elements are not free), which means Upstream subsystem development in cayenne agribusiness is very easily influenced by other institutions involved but does not affect other institutions. According to the Ministry of Agriculture, the upstream subsystem is an activity that provides goods as capital for agricultural activities. Future government policies need to be endeavors to be more conducive according to the needs of agricultural businesses.

3.2. The role of institutions in the development of onfarm subsystems

ISM analysis results on the institutional elements that play a role in the development of onfarm subsystem is shows in figure 2.

![Diagram](image)

**Figure 2.** DP-D Matrix of institutions in onfarm subsystem development.

Figure 2 shows that sub-elements of the Institute of Agricultural Technology Assessment (I), the Livestock and Food Crops Office (E), Farmers Group (A) and Extension (B) are in the Independent IV sector (the sub-element has a strong influence), each institution plays an important role in developing farming activities both management and technical in the field or the cultivation of cayenne. Bank Indonesia Representative Office (H) is in the position of Linkage III sector (sub-elements must be studied carefully because the variables are unstable.

SMEs Sambal Dayak (D), Brokers (C), Health Office (G) and Bank Rakyat Indonesia (K) is in sector II Dependent (sub-element is not free), which means the development of farming subsystems in cayenne agribusiness is very easily influenced by other institutions involved but does not affect other institutions,
while the Department of Trade, Cooperatives and SMEs (F) and the Agency Amil Zakat Nasional (J) is incorporated in the Autonomous sector I position (unrelated sub-elements), which means this institution has no connection to the development activities of cayenne farming in Tarakan City.

3.3. The role of institutions in the development of downstream subsystems
ISM analysis results on the institutional elements that play a role in the development of downstream subsystem is shown in figure 3.

Figure 3 shows that middlemen sub-element (C), the Farmer Group (A), the Trade, Cooperative and SME Office (F) and the SMEs Sambal Dayak (D) are in the Independent IV sector (the sub-element has a strong influence), each institution plays an important role in developing downstream activities including post-harvest activities, marketing to processing agricultural products into high-value products. This activity aims to obtain the income that is expected by every cayenne business in the City of Tarakan. The Food Crops and Horticulture Office (E) and Extension (B) are in the Linkage III sector (sub-elements must be studied carefully because the variables are unstable), because these institutions are easily influenced by institutions that play a role in the marketing of cayenne.

Bank Indonesia Representative Offices (H), National Amil Zakat Agency (J), Agricultural Technology Assessment Center (I), Bank Rakyat Indonesia (K) and the Health Service (G) are in sector II Dependent (sub-elements are not free), which means that the development of downstream subsystems in cayenne agribusiness is very easily influenced by other institutions involved but does not affect other institutions.
3.4. The role of institutions in the development of supporting subsystems
ISM analysis results on the institutional elements that play a role in the development of supporting subsystem is shown in figure 4.

Figure 4. DP-D Matrix of institutions in supporting subsystem development.

Figure 4 shows that Bank Rakyat Indonesia (K) sub-element, the Animal Husbandry and Food Crop Service (E), the Bank Indonesia Representative Office of North Kalimantan Province (H) and the Farmer Group (A) are in the Independent IV sector (sub-element has a strong influence), each institution plays an important role in supporting the activities of cayenne farming including capital, counseling and business financial management. The National Amil Zakat Agency (J), Extension (B) and the Trade and Cooperative and SME Office (F) are in sector III Linkage (sub-elements must be studied carefully because the variables are unstable), because these institutions are easily influenced by supporting institutions are in sector IV. Brokers (C), SMEs Sambal Dayak (D), Institute for Agricultural Technology Assessment (I) and Health Office (G) are in the II Dependent sector (sub-elements are not free).

3.5. Structural model of the role of institutions in the development of upstream subsystem
Based on the results of ISM analysis, the interrelationship between the institutions that play a role in the development of upstream subsystem, is shown in form of a structural model of the role of each institution presented in figure 5.
Based on figure 5, it shows that role in the development of upstream subsystems, namely the Livestock Service Office (E) and Food Crops and (I) Agricultural Technology Assessment Office at level 6. It shows that the institution has a very large influence on other institutions. The Food Crops and Horticulture Office guides and distributes production input assistance from Tarakan City government. The Food Crops and Horticulture Office affected the Farmers Group and the Bank Indonesia Representative Office of North Kalimantan Province for the development of facilities and infrastructure for cayenne in Tarakan City. Extension agents, Industry and trade services, National Amil Zakat Agency have an effect on the Farmers’ Group because these institutions provide the needs of Farmers Groups and other institutions at levels 2 and 1 are institutions that are influenced by the activities of institutions at the previous level.

3.6. Structural model of the role of institutions in the development of onfarm subsystem
Based on the results of ISM analysis, the interrelationship between the institutions that play a role in the development of onfarm subsystem, is shows in form of a structural model of the role of each institution presented in figure 6.

Figure 5. Structural model of upstream subsystem.

Figure 6. Structural model of onfarm subsystem.
Based on figure 6, it shows that role in the development of farming subsystems, namely the Livestock Service Office (E) and Food Crops which are at level 6. It shows that the institution is an institution that has a very large influence on other institutions. The Department of Animal Husbandry and Food Crops influences the Agricultural Technology Assessment Center (I) which is at level 5 because the agency has the task of (1) conducting research, study and assembling of appropriate agricultural technology and (2) implementing technology development and disseminating the results of the assessment and assembly extension materials needed by farmers. Other institutions at level 3 are influenced by Farmers Groups and institutions at levels 2 and 1 are institutions that are influenced by institutions at previous levels.

3.7. Structural model of the role of institutions in the development of downstream subsystem
Based on the results of ISM analysis, the interrelationship between the institutions that play a role in the development of downstream subsystem, is shows in form of a structural model of the role of each institution presented in figure 7.

![Structural model of downstream subsystem](image)

Based on figure 7, the structural model of institutions that support the development of farming subsystems, namely the Farmer Group at level 6. It shows that the Farmer Group is an institution that has great importance to other institutions in the life of the farming community. Farmer groups emphasize that middlemen need a supply of cayenne that is needed by farmers to carry out these business activities. SMEs Sambal Dayak (D) and the Department of Trade, Cooperatives and SMEs (F) depend on level 4, which is engaged in the processing of products carried out by middlemen. Other institutions at level 3 are placed by institutions at level 4 and institutions at level 2 and 1 are institutions taken by institutions at the previous level.

3.8. Structural model of the role of institutions in the development of supporting subsystem
Based on the results of ISM analysis, the interrelationship between the institutions that play a role in the development of supporting subsystem, is shows in form of a structural model of the role of each institution presented in figure 8.
Based on figure 8, the structural model of the institution that plays a role in the development of supporting subsystems namely Bank Rakyat Indonesia (K) which is at level 6. It shows that Bank Rakyat Indonesia is an institution that has a very large influence on other institutions. Bank Rakyat Indonesia is able to carry out all types of best banking activities by prioritizing the services provided to micro, medium and small business entities in order to improve the community's economy. Bank Rakyat Indonesia influences the Farmers Group (A), the Livestock and Food Crops Service (E) and Bank Indonesia Representative Office at level 5 to encourage the development of cayenne subsystems. extension agents (B) and the Department of Trade, Cooperatives and SMEs (F) are at level 4 as other supporting institutions affected by institutions at level 3. and other institutions at levels 2 and 1 are institutions that are influenced by institutions that are located at the previous level.

4. Conclusion
The structural model of the institution's role in the development of cayenne agribusiness system is based on key actors in each subsystem including (1) upstream subsystem: Food Crops and Horticulture Office and Agricultural Technology Assessment Office; (2) Onfarm Subsystem: Department of Animal Husbandry and Food; (3) Downstream subsystem: Farmer Group; and (4) Supporting subsystem: Bank Rakyat Indonesia.

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