

Mechanism model of technological incentives for the growth and development of small-scale Agro-industry groups in Indonesia (Case Study: Cocoa)

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Abstract

The Indonesian government has sporadically carried out coaching and development of small industries, in the form of technology incentives. However, this technology incentive is still misdirected, because there is no standard mechanism for providing technology incentives. Misdirected technological incentives will not strengthen the group. This study aims to build a model mechanism for providing technology incentives by the government to agro-industry groups (cacao case study). The study used a soft system methodology (SSM) approach. This study is in 11 conceptual models of the mechanism for providing incentives by the government. The key elements of the action program are sector/quadrant IV (Independent), namely determining the Leading Sector, providing technology incentives for agro-industry groups, and compiling a map of group-based cocoa industry development problems. These elements have the greatest driving power with the lowest level of dependence on other elements. This means the second and fourth institutional elements are the most important key elements.

Keywords: Soft-system; Cocoa; Agro-industrial; Groups; Technology-incentives; Model

1 Introduction

According to data from the Directorate General of Plantations [1], cocoa is one of the leading plantation commodities that has a perspective and great opportunity to improve people's welfare because most of it is cultivated through smallholder plantations ($\pm 94.01\%$) and until 2010 the cocoa area has reached 1,650,621 Ha with a production of 837,918. tons and spread over 32 provinces. Most of the types of cocoa cultivated are bulk cocoa, with the main production centers being South Sulawesi, Southeast Sulawesi, and Central Sulawesi. Besides, noble cocoa species are also cultivated by large state plantations in East Java and Central Java [2]. The increase in cocoa production in Indonesia takes place very rapidly. In 1967 Indonesia's cocoa production was still around 1,233 tons, in 1991/1992 it was 185,000 tons. In 2003 Indonesia's cocoa production reached 572,640 tons and in 2007 there were 779,186 tons.

In 2006, the Ministry of Trade analyzed the export competitiveness of several Indonesian agricultural and forestry commodities. The study uses various approaches such as comparative analysis and *trade mapping*, growth trends, foreign exchange contributions, and geographic distribution; it turns out that three commodities have the highest competitiveness composite index and have development prospects, namely palm oil, natural rubber, and cocoa.

During the 2018-2020 period, Indonesia's cocoa production tends to stagnate with an average growth rate of 0.76% per year. Production in 2020 is estimated at 773,409 tonnes. During that period, Indonesia's cocoa productivity was also almost stagnant with an average growth rate of 0.45% per year. Productivity in 2020 will be 611.71 kg/ha. This figure increased slightly, which in 2019 was still at 604.88 kg/ha. One of the reasons for increasing national cocoa productivity

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is the fact that most of the community's cocoa plantations, many of which have NGO partners. The NGO assists farmers to know and applying good cultivation techniques and is supported by adequate technological innovation. Guidance assistance by NGOs is thought to be an effort to streamline the *global value chain* of cocoa in the NGO donor countries [3].

Table 1 Area, Production, and Productivity by cocoa plantation status

Status	Description	2018	2019	2020*)	Growth	Contribution (%)
People's Plantation	Area (Ha)	1,584,133	1,574,322	1,557,120	-0.57%	98.40
	Production (Tons)	751,685	768,769	725,125	-1.19%	98.06
	Productivity	474.51	488.32	465.68	-0.62%	
State's Plantation	Area (Ha)	12,384	11,946	11,534	-2.34%	0.73
	Production (Tons)	7,715	7,392	7,026	-3.07%	0.95
	Productivity	622.98	618.78	609.16	-0.75%	
Private's Plantation	Area (Ha)	14,497	14,379	13,752	-1.74%	0.87
	Production (Tons)	7,880	7,817	7,332	-2.37%	0.99
	Productivity	543.56	543.64	533.16	-0.64%	
Amount	Area (Ha)	1,611,014	1,600,647	1,582,406	-0.60%	
	Production (Tons)	767,280	783,978	739,483	-1.22%	
	Productivity	476.27	489.79	467.32	-0.63%	

*) provisional figures; Source: Indonesian Plantation Statistics for Cocoa Commodities in 2018-2020

Table 1. Above also shows that the total cocoa production in Indonesia is a collection of smallholder plantations, large state plantations, and large private plantations. Production results from smallholder plantations are the largest contributor to production compared to production from large state plantations and large private plantations. Thus, moving the downstream cocoa industry based on people's groups is expected to improve the welfare of cocoa farmers. The description of the amount of cocoa production in Indonesia is certainly related to the area of the cocoa plantation itself.

In terms of quality, Indonesian cocoa is not inferior to world cocoa where if properly implemented it can achieve a taste equivalent to that of Ghanaian cocoa and Indonesian cocoa has the advantage that it does not melt easily so it is suitable for *blending*. In line with these advantages, Indonesia's cocoa market opportunities are quite open for both export and domestic need.

Programs for group development are pro assists sectors of economic development. The government assists in the form of incentives and assistance for agricultural extension guidance to groups. One form of assistance provided is technological incentives in the form of providing processing tools and machines. This assistance is expected to be that to encourage increased use of technology by groups that are expected to improve the welfare of farmers [4].

These programs need to be reviewed and evaluated for their success. Meanwhile, in the form of practical actions, there are many cases, lack of running of these programs properly. This is due to the lack of compatibility between the aid program and the conditions and abilities of the recipients of incentive assistance. As a result, many activities are less effective and not utilized (useless).

To overcome the problems mentioned above, a model for the growth and development of agro-industry groups based on strong and independent groups is needed. Group growth means a process or a way to grow a group while development is defined as a way or process to develop a group. This model is useful for assisting policymakers (government) and decision-makers in growing and developing farmer groups/groups that will be given technological assistance/incentives. This incentive is expected to strengthen the cocoa downstream process at the farmer level, to achieve equitable welfare among the actors.

The purpose of this study is to develop a model of the mechanism for providing technology incentives by the government in the context of the growth and development of agro-industrial groups in Indonesia. The research is limited to cocoa commodities. The cocoa commodity has the advantage of being cultivated mostly from smallholder plantations; so the added value of downstream is also enjoyed by farmers.

2 Methodology

This research was conducted with data and information sources from Jakarta, Payakumbuh, Jembrana, Kendari and Bogor, Indonesia. The search and collection was carried out from September 2021 to December 2021. The main sources of data collection were obtained directly and indirectly from sources, either through in-depth interviews or from the available literature on the development of the chocolate industry by resource persons. Direct data collection was obtained through online interviews. Data collection was carried out by three methods, namely (1) observation (2) semi-structured interviews, and (3) literature study.

Checkland developed a set of tools to help users perform steps such as: Rich picture, Conceptual model, CATWOE and Formal Systems Model. SSM views that any real world is characterized by the point of view of everyone who is in the real world entity, and even these various points of view are often contradictory to one another. The real world is complex, problematic, mysterious, and marked by contradictions between worldviews [5].

Seven stages of SSM according to Checkland and Scholes [6]: Problem situation considered problematic (Determining and understanding the problem situation), Problem situation expressed (Stating the problem situation), Root definition of relevant of purposeful activity systems (Choose a point of view to see the situation and produce a definition root of the problem), Conceptual models of the systems named in the root definitions (Choose a point of view to view the situation and produce a root cause definition), Comparison of models and real (Comparing models with the real world), Changes systematically desirable, culturally feasible (Stating changes what is expected and possible to do), Action to improve the situation (Take action to improve the real world situation). Checkland defines 7 stages in SSM which is also known as Checkland protocol.

The ISM technique is a group assessment process in which structural models are generated in order to portray complex matters of a system, through carefully designed patterns using graphs and sentences. The ISM technique is primarily intended for assessment by a team or can also be used by researchers [7].

The basic principle is that the identification and structure within a system will provide high value for benefits in order to design the system effectively and make higher decisions. In the ISM technique, the program whose structure is analyzed is divided into elements where each element is further broken down into a number of sub-elements. Studies in related program planning provide an in-depth understanding of the various elements and roles of institutions in order to achieve better and more acceptable solutions. The ISM technique provides a basis for analysis where the information generated is very useful in policy formulation and strategic planning. The ISM technique is very suitable for structuring programs based on the key elements that have the highest driving force and the lowest level of dependence. Each output of an element (subsystem) is an input for another element (subsystem).

3 Problem Exposure

Based on the SSM stages, the disclosure and description of the problem is the initial stage and the second stage. The first and second stages are a picture of the real world (real world). In the SSM process, this is in the form of disclosing problem situations (problem situation expressed). In stages one and two, two parts are presented, namely the disclosure of the problem situation and the description of the problem situation (rich picture). All these stages are carried out by gathering the opinions of practitioners and experts in the field of cocoa agro-industry and group and institutional growth through formal and informal approaches in various meetings, discussions, document reviews, to focus group discussions (FGD). The form of interaction of opinion and perception exploration is also carried out during the confirmation process of the results of the rich picture, root definition, purposive activity model, and comparison with the real world.

The interview is a tool for proving and rechecking the information that has been previously obtained. The interview technique used in this research is an in-depth interview. Before conducting the interview, the discussion material was prepared and ended by summarizing all the results of the discussion and study.

At the stage of disclosing the problem situation, Checkland and Poulter suggest using intervention analysis (analysis one), social analysis (analysis two), and political analysis (analysis three[8]). Based on the results of interviews and observations in the field, stakeholders who play a role in cocoa agroindustry can be grouped into three important actors, namely, the government, farmers or farmer groups as cocoa bean producers, and business actors or technopreneurs (including cooperatives or other business entities). The following are the stages of disclosing the problems of the people's cocoa agro-industry:

3.1 Intervention Analysis

Analysis of the intervention focused on determining the three parties who play a very important role in relation to the problem situation of growing a cocoa agro-industry group model based on technology incentives at the government level, farmer groups, and business actors.

- Client (Client) – C: Researcher
- Practitioner-P: Researcher
- Issue owner (Problem Owner) – O:

3.1.1 Government

Stakeholders at the government level are the Central Government (Ministry of Agriculture and Ministry of Industry), Provincial Government (Plantation Service and Industry and Trade Office), Regency Government (Perindagkop Service).

3.1.2 Technopreneur

Technopreneurs are people or institutions that have the ability to connect between supply chains and carry out value-adding processes, either through processing or other means. These institutions include cooperatives, a combination of farmer groups, entrepreneurs, cocoa farmer assistants, economic welfare management institutions.

3.1.3 Provider of raw materials for cocoa industry

The suppliers of these raw materials include farmers or farmer groups. The result of this intervention analysis is the identification of the problem situation in the growth model of cocoa agroindustry groups based on technology incentives in each stakeholder.

3.2 Social Analysis

In this social analysis, it is focused on the *role*, norms, values, each element of each stakeholder in the growth of cocoa agro-industry groups based on technology incentives.

3.2.1 Role

Each element of each stakeholder has a basic role that reflects his social position in the growth of the cocoa agro-industry group based on technology incentives.

The following is the role of each party in the utilization of agricultural resources:

The government has roles, among others

The government acts as a regulator and facilitator as well as providing social services to create an increase in the welfare of the community, especially the actors involved in it. In solving problems that occur in the growth of cocoa agroindustry groups with the principle of togetherness of *stakeholders* including local governments, intermediary institutions (NGOs, Poktan, LEM, cooperatives, technopreneurs) and cocoa agroindustry communities (farmers, traders, small chocolate processing industries).

Technopreneur

This word refers to a person or agent who creates a business with the courage to take risks and uncertainties to achieve profit and growth by identifying existing opportunities [9]. More broadly, Gumbira-Said [10] explains that there are three components that build the term technopreneur, namely, R&D capacity (research and development), entrepreneurship and *venture capital*. Eriyatno [7], mentions the term technopreneur as a combination of entrepreneurship and technology. Could include traders and processors. Technopreneurs function to improve the welfare of farmers with a role in bridging/facilitating between the interests of farmers as a whole and *stakeholders* in an effort to improve the welfare of farmers. Traders play a role in selling cocoa beans produced by farmers to industry

and downstream. Processors play a role in carrying out business activities to process agricultural products as a source of income.

Providers of raw materials for the cocoa industry have roles including:

Plays a role in carrying out good cocoa cultivation and post-harvest activities to obtain beans that comply with SNI standards to be sold to traders as a source of farmers' income.

3.2.2 Norm

According to Checkland and Poulter [8] norms are expected behaviors associated with roles. The existing norms in the growth of cocoa agroindustry groups are related to the role played by each stakeholder. The norms that apply to each stakeholder are:

- The central, provincial and district governments are subject to a code of ethics in carrying out their activities. The code of ethics that applies to the government is the laws and regulations, both central and regional which regulate the government's work mechanism.
- Technopreneurs, cooperatives, and NGOs assisting cocoa farmers as intermediary institutions adhering to the Articles of Association/Budgets and the organizational code of ethics that have been mutually agreed upon by all members of the organization and formal and informal agreements with farmers and traders as suppliers of raw materials.
- Suppliers of raw materials, namely farmers and traders, adhere to informal agreements that have been mutually agreed upon. This agreement supports each other and facilitates the use of cocoa beans for mutual benefit.

3.2.3 Values

Values are standards or criteria for which behavior fits the role. At the government level, technopreneurs (intermediate institutions) and suppliers of raw materials, the values owned by each are as follows [8]:

- The government is to formulate policies that encourage downstream cocoa by business actors to obtain benefits for improving welfare.
- The intermediate institution holds the values of justice, equality, togetherness, independence, and transparency.
- Suppliers of raw materials (farmers/farmer groups) adhere to the values of togetherness, upheld customary values, and independence.

The three social elements are closely related, dynamic, and always changing.

3.3 Problematic Situation Description

To identify problematic situations in the mechanism for providing technological incentives to agro-industry groups, interviews or in-depth discussions were conducted with several issue owners from stakeholders in the growth of cocoa agro-industry groups. In addition to identifying problematic situations, in-depth discussions were also conducted to find out the problematic situations of agro-industry development policies and agro-industry groups. The following describes the opinions, views, and statements of the informants regarding the problems felt by the government, traders and farmers in the development of the cocoa industry. This expert opinion is obtained from the results of direct interviews.

3.3.1 Problematic Situation Summary

The problematic situations encountered in providing these technology incentives can also be summarized by each stakeholder in this process. The complete results of the opinions of the stakeholders above are presented in table 2 below this:

As one of the largest cocoa producers in the world, the development of the downstream industry is expected to be a driving force for the cocoa agribusiness system to increase added value that is more competitive. This is important because industrial development will encourage primary agricultural growth and even generate rapid and equitable national economic growth so that agro-industry development must occupy a central position in the government's strategy[11]. Increasing the added value of cocoa can also be obtained through downstream strengthening of the domestic industry in the food, restaurant, pharmaceutical, candy cake and ice cream industries[12].

Table 2 Results of stakeholder opinions and thoughts on the problematic situation of providing technology incentives

Stakeholders	Opinion and thoughts	
Technopreneur/ Leader of group farmer	<p>“the process of “upgrading” farmer groups must be made in stages with assistance from the government’</p> <p>“it takes time to grow the agro-industry vision in farmer groups and requires the role of technopreneurship”</p>	
	<p>“The process of internalizing mutual trust must continue and be initiated by the entrepreneur with the assistance of government assistance”</p> <p>“The government also needs to think about unfermented or unfermented cocoa beans. We need to think about alternative solutions, or maybe a small-scale, poktan-based processing process can be a solution.”</p>	
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Industries	<p>“policy and development of farmers upstream must be intensive and if necessary incentives must be provided by the government”</p> <p>“It is difficult for Small and Medium Industries (SMEs) to compete with large industries. The production efficiency of SMEs cannot reach the level of efficiency as in the efforts of large industries”.</p>	
Farmer	<p>“Farmers have to pay for assistance, certification costs and there is still a risk that the industry will not buy it because they don't know the capacity of their needs, which should also be the responsibility of the government”</p> <p>“Farmers feel that government policies are more aimed at the interests of large businesses/industry”.</p> <p>“Farmers are willing to hand over fermented cocoa first with later payment”.</p>	
Farmer Assistance	Technical	<p>“It is necessary to formulate the right model of assistance by the government, NGOs and industry so that the cocoa agroindustry based on farmer groups can grow better and faster”</p>
CONSULTANT/EXPERT	<p>“The Indonesian cocoa bean trade is part of the global chain. <i>Global value chains</i> from chocolate industrial countries such as Germany, France, Belgium and the US are trying to maintain <i>the supply chain</i> for the sustainability of their industry.”</p> <p>“It is necessary to formulate a mechanism for forming groups on whose initiative, so that conflicts can be minimized and the group can <i>survive</i> ”</p> <p>“It is necessary to consider how the mechanism for the supply flow of cocoa beans in the value chain within the cocoa agro-industry group is purchased or entrusted to be processed as is usually done by milk processing cooperatives”</p> <p>“There is no good coordination in the development of this industry. so we already need an institution like FAMA in Malaysia that is authorized to develop primary industries under one ministry umbrella.”</p> <p>“Formation of farmer groups and agricultural product processing groups should come from groups that already exist and have local wisdom, such as Subak, farmer groups, farmer associations and other forms that have existed for a long time”</p>	

3.3.2 *Root definition and Conceptual Model of Technology Incentive Mechanism*

In this section, two stages are carried out, namely, the third stage is the *root definition*, and the fourth stage is compiling a conceptual model:

Root definitions

Root definition is a way to describe the system for the system modeling process. Checkland and Poulter [9] at this stage use the general formula PQR in compiling the *root definition (RD)*. PQR formula: *do P, by Q, in order to help R*. This formula will answer the what, how and why of research. So that the compiled RD can really be used as a conceptual model, it needs to be tested and refined with the CATWOE analysis tool (*Customers, Actors, Transformation, Worldview, Owner, Environment*) in analyzing the transformation process [5]. RD and CATWOE are sources from making activities on the *purposeful activity model* used which refers to the mechanism of providing technology incentives.

In the third and fourth stages, human activity systems have been identified that have purposes that are relevant to the problematic situation in the growth of cocoa agro-industry groups, namely:

The institutional mechanism for providing technology incentives by the government, especially by relevant supervisors.

The above system is made of RD and *conceptual model (CM)* which will be an intellectual tool to conduct discussions and dialogues about the problematic situations faced in the context of technological incentives for the growth of cocoa-based industrial groups.

Based on the results of the collected CATWOE *root definition*, a *cocoa agro-industry group growth model* was developed which included the collection and structuring of the minimum activities needed to carry out the transformation process using CATWOE elements. The conceptual model consists of goal activities that have been tested 5E (*efficacy, efficiency, effectiveness, elegance, ethicality*), which include:

The *efficacy* test is to test whether the purposeful activity does produce the desired output.

- *Efficiency* test is to test whether the purposeful activity uses minimum resources.
- The *effectiveness* test is to test whether the objective activity can effectively achieve the desired long - term goal.
- *Elegance* test namely measuring whether the transformation process carried out is elegant; and
- The *ethicality* test is to see if the transformation process is justified morally.

The human activity system that has the above purpose is part of the system for growing cocoa agro-industry groups based on technological incentives, which begins with the growth of cocoa agro-industry groups from groups that already exist in the community. The groups that currently exist are generally those under the auspices of the Ministry of Agriculture. These groups produce raw materials for cocoa beans as the main input in the supply chain system of the cocoa agro-industry. These groups then, on the initiative of the technopreneurs, carry out the process of internalizing the agro-industrial vision. Technopreneurs can come from internal groups or from external groups. Externally, such as extension workers, apprentices or staff prepared by the government. These innovators are generally people who have received guidance and training from the government or universities. From the internal group, technopreneurs are individuals who have the initiative in creation and innovation. Changes are made by the innovators, namely the technopreneurs. Institutional change will be possible if the change focuses on the innovators and reduces the role of the naysayers. Giddens [13], in his theory of structure also state that institutional changes in a society are carried out by the change agents within the institution. These *agents of change* can consist of innovators or technopreneurs. Stewart [14] states that in an organization or society, humans follow a normal curve diagram. That is, in a group there will be 2% who are ready to become innovators or supporters of innovation (read: change).

The main activity in this CM is coordination between government agencies that foster cocoa agro-industry groups. To support the acceleration of the "upgrading" process, from farmer groups to industrial groups, what is needed is the ranking of cocoa agro-industry groups based on need and mastery of technology in the context of technological incentives. For the need for continued development of this group, it is necessary to formulate internal institutional patterns (management, transaction systems) in order to strengthen the institutions of cocoa agroindustry groups; so that the risk of conflict can be reduced in the future. Because most of the farmer groups / farmer group associations disbanded due to conflicts between members and administrators.

Along with this process, agro-industry sector coaches are encouraged to coordinate more intensively so that coaching can run well. When Law No. 3 at 2014, concerning industry was issued, it was explicitly stated that the agency authorized to develop agro-industry or downstreaming was the Ministry of Industry. However, without coordination and without cooperation with the agricultural sector, it is impossible for the downstream process to run. Agroindustry without a guaranteed supply of raw materials will not work. To get support from all stakeholders, it is necessary to disseminate information on the ranking of existing farmer groups or other groups in order to obtain input on the initial state of the forerunner of agro-industrial groups in Indonesia.

The government may issue a policy regarding the exclusion of agro-industry development originating from groups or a combination of farmer groups by the Ministry of Agriculture. This has been done by the government through Government Regulation no. 17 of 1986, concerning the delegation of authority for the development of several industries to other ministries from the ministry of industry. This policy proposal is for the government to give the authority to develop agro-industry originating from farmer groups or a combination of farmer groups to the Ministry of Agriculture for the sustainability of fostering sustainable agro-industry groups. In practice, the Ministry of Agriculture has provided guidance to cocoa agro-industry groups through the Director of Processing and Marketing, Director General of Plantations.

The conceptual model in the form of human activities that have a purpose (*purposeful activity*) for the above system is:

- The government in charge of cocoa at the central, provincial and district levels conducts a thorough evaluation of programs, activities and budgets that have been running so far.
- Mapping the problems of growing cocoa agro-industry groups and cocoa downstream faced by business actors through discussion and absorption of aspirations to all parties (business actors, universities, NGO associations, and others).
- Technology incentive programs, activities and budgets based on a map of the problems faced by business actors.
 - cocoa agroindustry groups
 - Ranking of cocoa agroindustry groups based on need and mastery of technology
 - Machine and processing equipment assistance program in the context of technology incentives
- Discuss programs/activities with experts from universities and other related parties
- Distribute program activities in solving problems faced by business actors to the central, provincial and district governments according to their capabilities and authorities.
- Each party proposes programs, activities and budgets in accordance with the agreement so that they do not overlap.
- Establishment of implementing teams at the central, provincial and district levels.
- Implementation of activity programs with the involvement of all parties, including the government, advisory institutions/consultants and business actors in an integrated manner.

Table 3 Conceptual Model Performance Measurement Criteria

Efficacy (Efficacy)	The creation of coordination, interaction in the preparation and implementation of optimal programs/activities based on attachment (embeddedness)
Efficiency	Using minimum resources (financial and time)
Effectiveness (effectiveness)	Achieving consensus and coordinating the implementation of an integrated program of activities (collective action).
(Elegance)	The process of transformation and coordination is actively supported by all stakeholders
Ethics (Ethicality)	The transformation process gains moral recognition from all stakeholders.

To ensure the transformation process goes well, it is necessary to apply several performance performance criteria which include the creation of coordination, interaction in the preparation and implementation of optimal programs/activities based on *embeddedness*. The transformation process needs to be seen also from the success of achieving minimal costs while still paying attention to the implementation of incentive programs so that the downstream process of cocoa beans can run. In addition, this transformation process must involve all stakeholders so that the process runs smoothly.

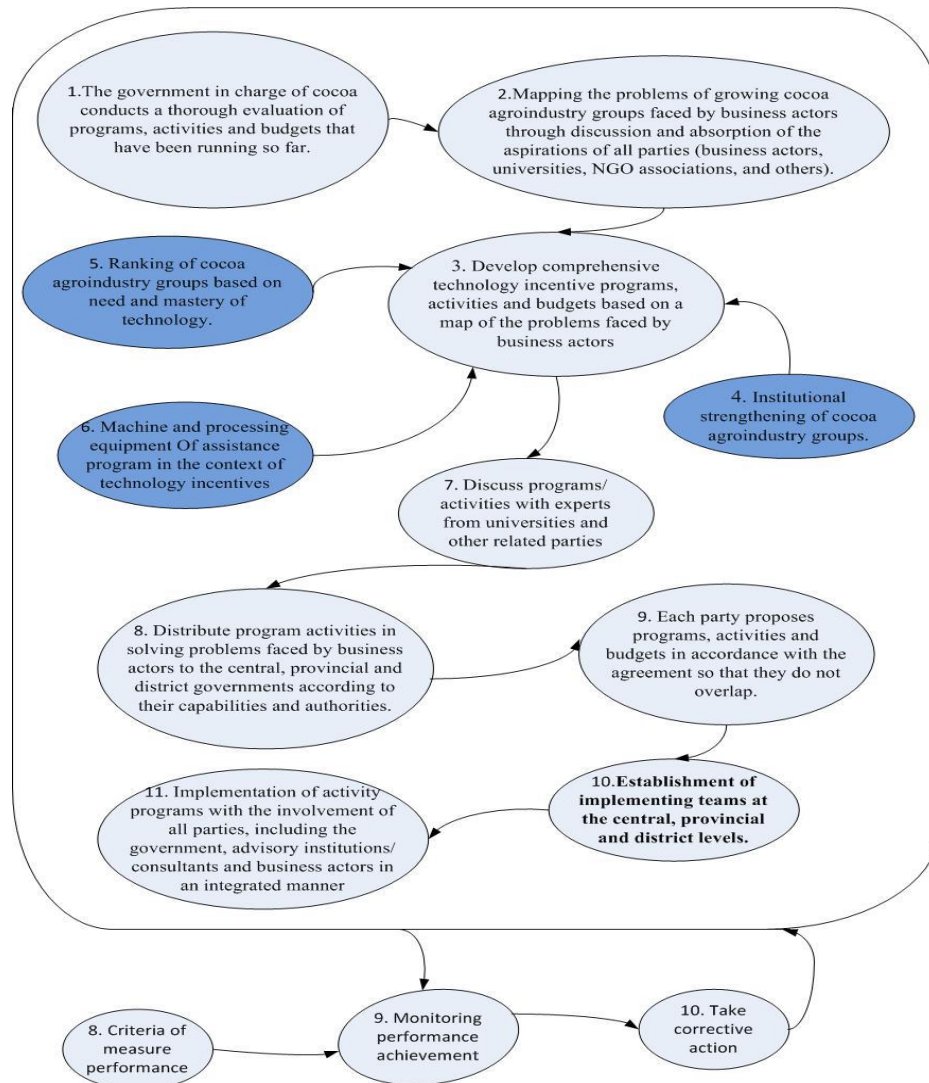


Figure 1 Activities in the *Purposeful Activity Model System*

3.3.3 Gap in Ideal Conditions for Growing Cocoa Agroindustry Groups Based on Technology Incentives in Indonesia

This stage is the fifth, sixth and seventh stages of SSM. At this stage the researcher will compare the Conceptual Model produced in stages 3 and 4 with the real world, in order to obtain a broader paradigm (worldview) to formulate suggestions for improvement. The purposeful human activity system (holon) is a tool that allows managed discussions to be able to answer critical questions using the 5W 1 H frame (*What, When, Where, Who, Why and How*).

At this stage, it is very possible for SSM practitioners to have difficulty in answering questions related to performance measurement. This difficulty can occur because of the complexity of the real world [9]. With the emergence of these various points of view, it will encourage the emergence of a desire to carry out activities that have a purpose, which can be used as suggestions for formulating changes, improvements or improvements to problematic situations in the real world.

Social capital and shared vision must be built before institutional rules are prepared. So it is very important for the government to encourage the change process to start from within the group itself [15]. The task of the government and extension workers is to provide information and easy access to farmer assistance institutions. The results of this arrangement were then tested and then used by the cocoa agro-industry group.

System: institutional mechanism for providing technology incentives by the government, especially by relevant supervisors

Table 3 Implementation of the fifth, sixth and seventh stages of SSM

Activity	Real world situation	The gap that happened	Suggestions for improvement
The government in charge of cocoa conducts a thorough evaluation of programs, activities and budgets that have been running so far.	There has been a coordination meeting as a follow-up to the implementation of Law No. 3 of 2014, concerning industry	There is no agreement on a group-based agro-industry development program, whether under the Ministry of Industry or with upstream sector supervisors such as agriculture, forestry and fisheries.	Making legal rules for the delegation of authority for group-based agro-industry development to upstream sector supervisors
Mapping the problems of growing cocoa agroindustry groups faced by business actors through discussion and absorption of the aspirations of all parties (business actors, universities, NGO associations, and others).	It has been done before but is still divided into sub-sectors. Donor agencies such as USAID and AUSAID have also done this.	Mapping of problems tends to be seen as a sectoral problem, not a problem as a whole.	Coordinating Ministry as a coordinating center together with the Ministry of Agriculture and making a group-based cocoa development problem map
Develop comprehensive technology incentive programs, activities and budgets based on a map of the problems faced by business actors. Institutional strengthening of cocoa agroindustry groups Ranking of cocoa agroindustry groups based on need and mastery of technology Machine and processing equipment assistance program in the context of technology incentives	Not done yet	The ministry's programs still tend to be sectoral, if anyone sees it as a whole they are still confused, because there is no legal basis for it	The President must determine the Ministry of Agriculture cq. The Directorate of Plantation Product Processing or the Director General of Small and Medium Enterprises of the Ministry of Industry is set to become the leading sector for the development of group-based cocoa agroindustry, as well as run technology incentive programs for cocoa agro-industry groups.
Discuss programs/ activities with experts from universities and other related parties	Done but still limited according to sectoral problems	Often the main problem that needs to be fixed is the lack of coordination	Need follow -up coordination of suggestions and input from related parties
Distribute program activities in solving problems faced by business actors to the central, provincial and district governments according to their capabilities and authorities.	The division of roles in program activities has been carried out according to the existing menu. Central government has APBN and Co-administered Tasks (TP), local governments have APBD and special allocation funds (DAK)	Many programs are still <i>top-down</i> . Even though the suggestion came directly from the group.	Local governments at the same time look for problems that need to be resolved at the group level.

Each party proposes programs, activities and budgets in accordance with the agreement so that they do not overlap.	There is not any yet	Not done	Related parties such as Bappenas and the Coordinating Ministry for the Economy will mediate if there are problems and overlapping activities and target groups
Establishment of implementing teams at the central, provincial and district levels.	There have been implementers at each level but they are still sectoral.	There is not any	Waiting for the decision on the division of authority to foster agro-industry groups
Implementation of activity programs with the involvement of all parties, including the government, advisory institutions/consultants and business actors in an integrated manner	Not yet, because the activities are still sectoral	There is not any	

Many programs and activities in the context of developing group-based cocoa agro-industry have been carried out as described in the previous description. These programs are generally budget-owned by the central government. At the central and regional levels, this budget and program is divided into each sector of cocoa agro-industry coaches. In the upstream sector, the Ministry of Agriculture has the authority to develop cocoa farmers and plants; and in the downstream sector, the Ministry of Industry has the authority to develop downstream cocoa beans.

The development of group-based cocoa agroindustry still has overlapping programs and activities. For this reason, it is urgent for the government to reaffirm the division of authority for this agro-industry development, especially cocoa. The division of authority for the development of this industry had existed during the previous government (PP no. 17 of 1986). However, the development of group-based industries (other than cooperatives) does not yet have a legal umbrella that regulates it, so program overlaps often occur. While waiting for this legal umbrella to be made, it is urgent to coordinate between these agro-industry supervisors, especially cocoa.

The development of agro-industrial groups must be carried out in stages according to the readiness and conditions of the group. Wahyuni *et al.* (2007) stated that the agro-industry development strategy can be divided into several stages, the initial stage or initiation, the growth stage and the industrial maturation stage [16]. It is strengthened by Bantacut [17] that the basic assumption of people's economic development (agriculture and agroindustry) must go through various stages of the process such as (a). establishment of new institutions or strengthening of existing institutions, (b). development of alternative business units or industries, (c). improvement of labor capacity, (d). identification of new markets, (e). transfer of science and technology, and (f). new company development.

The ultimate goal of capacity building for cocoa agroindustry groups is to improve the welfare of rural communities as group owners. In order to achieve this goal, Zakaria proposes to direct the development of this agro-industry group to (a) industrial cluster development, namely the development of integrated agro-industry with raw material centers and supporting facilities; (b) the development of small-scale industries supported by medium and large enterprises; and (c) industrial development options for export and domestic needs [18]. The development of agro-industry groups, especially those that must be developed, is the technological aspect. In accordance with the type of industrial group that has a unique technology [19].

This capacity development in the research is carried out in the form of technology incentives from the government. Technological incentives in the context of developing agro-industry groups, which in this study adopted the opinion of Millen [20], who proposed increasing institutional capacity by means of: counseling and training, technical assistance, and mentoring. The difference between extension and mentoring is that the extension worker is not necessarily an expert but rather is a transmitter of information, while the assistant is required to have a classification as an expert or at least understand the problem better than a farmer. Both extension workers and assistants are required to have intense contact with members of the group being served [21].

- Strategy for Providing Technology Incentives for the Development of Cocoa Agroindustry Groups

By using interpretative structural model (ISM) processing software, processing elements of the technological incentive process and the need for further action are carried out . Series of activities from mechanism for providing technology incentives in the form of activity elements needed for planning its implementation. This series of activities is the result of the previous activity, namely the conceptual model of the mechanism for providing technological incentives to agro-industry groups. These activities are then determined by the key activity elements that become the driving force for other elements.

The next step in the effort to provide technological incentives in every system of human activity that has a purpose, from the system has its own needs in the transformation process. The approach used is logical synthesis of Interpretative Structural Modeling (ISM). In this method, the initial stage of the activity is the acquisition of expert opinion, namely filling in the matrix with the symbols of the letters V, A, X, O.

The table of activity elements as a result of the conceptual model of the incentive mechanism can be simplified into table 4. below:

Table 4 Mechanism of Providing Technology Incentives

No.	Process Elements of Technology Incentive Activities
1	Preparation and Strengthening of Technology-based Agroindustry Groups
2	Determination of <i>Leading Sector</i> to provide technology incentives for agro-industry groups
3	Granting authority to the <i>leading sector</i> to foster agro-industry groups from upstream to downstream
4	Compilation of a group-based cocoa industry development problem map
5	Follow-up coordination of the preparation of activities from suggestions and input from related parties
6	Socialization _ technology incentive based cocoa industry development activities
7	Coordination with local governments while looking for problems that need to be resolved at the group level
8	Bappenas and the Coordinating Ministry for the Economy will mediate if there are problems and overlapping activities and target groups for technology incentives
9	Establishment of implementing teams at the central, provincial and district levels.
10	Identification of the target group of recipients of incentives
11	Implementation of technology incentive activities and their monitoring

The results of the analysis with *ISM*, using the *Expert Choice application*, in the form of a *Driver Power-dependence* matrix for elements of the technology incentive mechanism system can be seen in Figure 2. The key element of the action program is in sector/quadrant IV (*Independent*), is determining the *Leading Sector* providing technology incentives for agro-industry groups and preparing a group-based problem map for cocoa industry development. These elements have the greatest driving power with the lowest level of dependence on other elements. This means, element is the most important key element .

Elements that are in quadrant III/linkage are elements that have a big influence on other elements so that they need careful action and study. These elements are: granting authority to the *leading sector* to foster agro-industrial groups from upstream to downstream, socialization of technology incentive-based cocoa industry development activities, formation of implementing teams at the central, provincial and district levels, identification of target groups receiving incentives, and implementation of technology incentives and monitoring activities .

Based on Figure 3, level 3 is a hierarchy or key indication, where the elements 5 is the first key (follow-up coordination in the preparation of activities from suggestions and input from related parties as well as the preparation and strengthening of technology-based Agroindustry Groups) , while level 1 (coordination with local governments as well as looking for problems that need to be resolved at the group level) is an element that is not too influential in the process of providing technology incentives.

The development of a group must be in accordance with the needs of the group. After obtaining the group ranking class, the intervention strategy or technology incentive is adjusted to the group scale and the results of the technometric assessment of the cocoa agroindustry group.

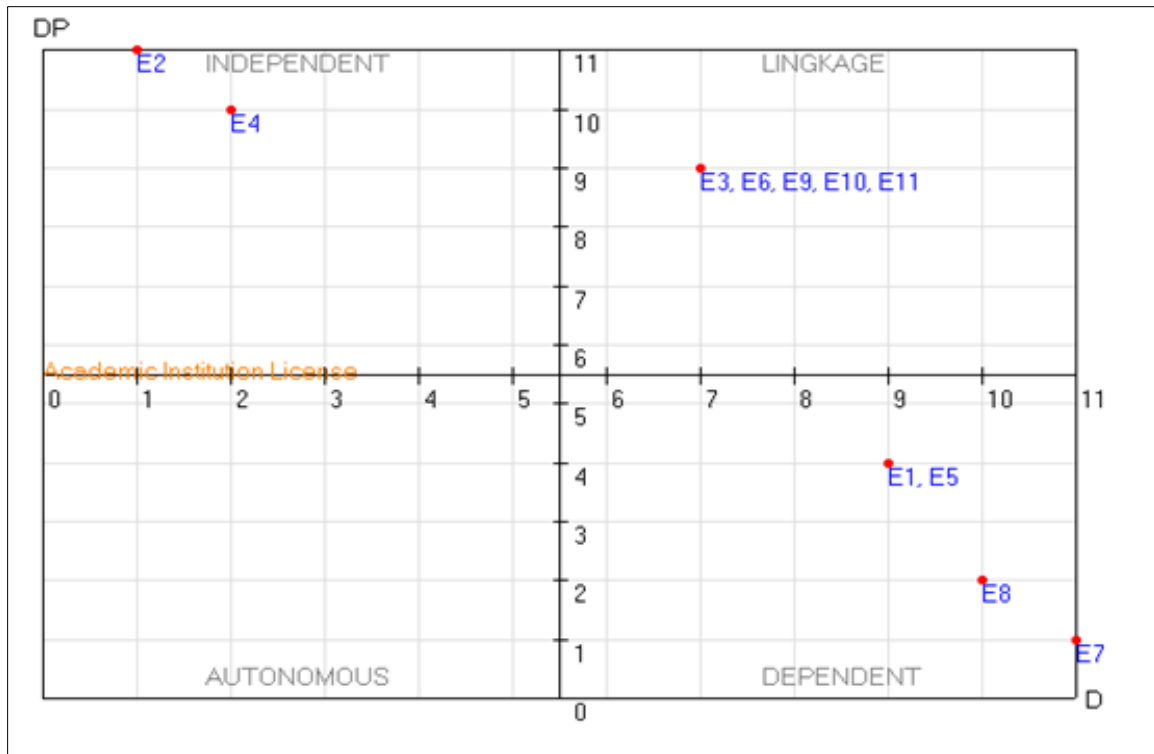


Figure 2 Driver Power-dependence Matrix for system elements

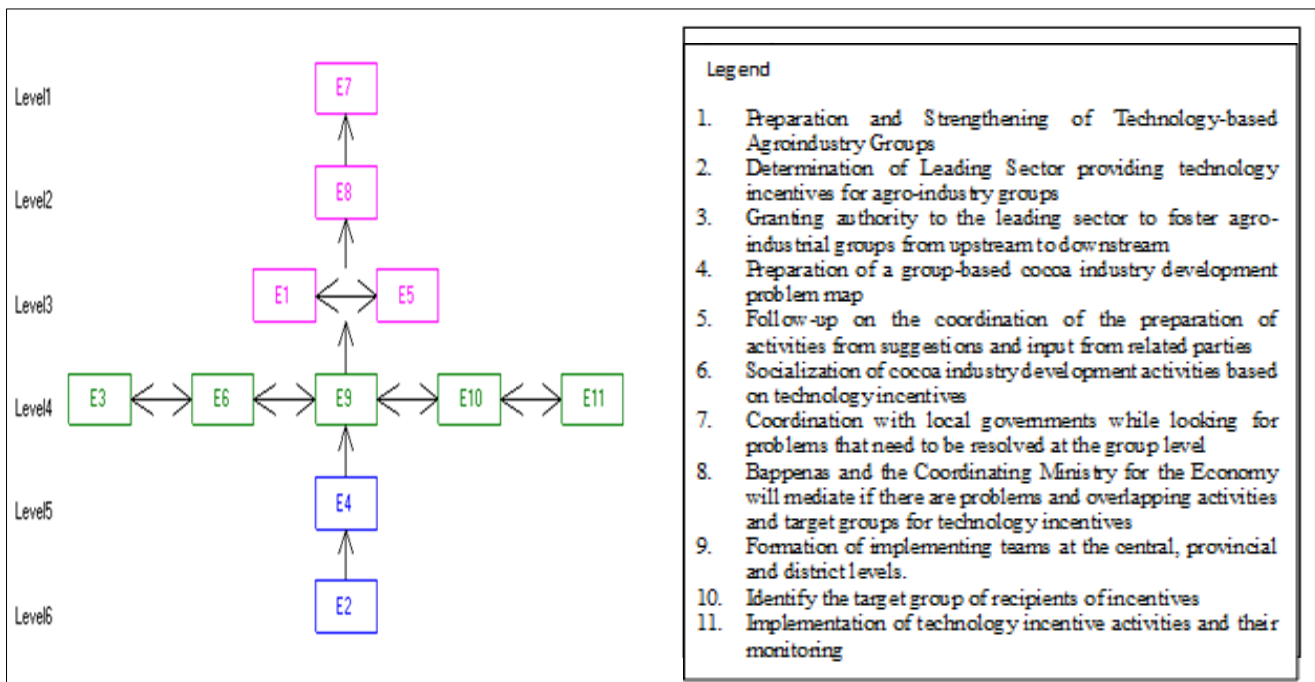


Figure 3 The structure of the process element system of the technology incentive mechanism

4 Conclusion

Research using the SSM method produces 11 conceptual models that are the main activities of the mechanism system for providing technological incentives to agro-industry groups, namely: Preparation and Strengthening of Technology-based Agro-industry Groups, Determining *Leading Sectors*, providing technological incentives for agro-industry groups, Giving authority to leading sectors to foster agro-industry groups from upstream to downstream, Compilation of group-based agro-industry development problem maps (case study: cocoa), Follow-up coordination of activity preparation from suggestions and input from related parties, Socialization of technology incentive-based cocoa industry development activities, Coordination with At the same time, local governments look for problems that need to be resolved at the group level, Bappenas and the Coordinating Ministry for the Economical will mediate if there are problems and overlapping activities and target groups for technology incentives. Implemented at the central, provincial and district levels, Identification of target groups of recipients of incentives, and Implementation of technology incentive activities and their monitoring. From the ISM analysis, it was found that the key elements of the action program are in sector/quadrant IV (*Independent*), namely the determination of the *Leading Sector*, the provision of technology incentives for agro-industry groups and the preparation of a group-based problem map for the development of the cocoa industry. These elements have the greatest driving force (*Driver Power*) with the lowest level of dependence on other elements. This means, the second and fourth institutional elements are the most important key elements.

Suggestion

- To increase the competitiveness and bargaining value of farmers on cocoa commodities, the government needs to consider the feasibility and vertical integration between each cocoa agro-industry value chain so that government assistance can be efficient and effective. The government needs to encourage farmers to ferment cocoa beans. There needs to be a very strong role from the government to integrate each value chain, and encourage entrepreneurs to partner with farmers so that farmers get equitable benefits for the commodities they grow.
- This study suggests continuing the improvement action activities for the transformation of agro-industry groups based on technology incentives to develop a more detailed group ranking model and good governance.
- The government as an influential party in the process of change builds coordination between government agencies that foster cocoa agroindustry.
- Further research can analyze the feasibility of vertical integration for the conditions of fermented and unfermented cocoa beans. Further research is needed technologically and institutionally on the requirements that must be prepared by farmer groups so that vertical integration is successful.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflicts of interest regarding the publication of this paper.

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