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Study of the Role of Institutional Strengthening in Increasing Coconut (C. Ocos Nucifera) Production to Support Coconut Downstreaming in West Sulawesi

Muhsin[1*], Akhmad[2], Irma Sribianti[3]
[1] Doctoral Student in Agribusiness
[2,3] Postgraduate Program of Muhammadiyah University of Makassar
Corresponding Author: Muhsin mahsinhusainumm@gmail.com

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ABSTRACT

This study aims to analyze the role of institutional strengthening in increasing coconut production as an effort to support the coconut downstreaming program in West Sulawesi Province. Although this region has significant coconut resource potential, farmer productivity remains below optimal standards due to weak institutional capacity, limited access to technology, and the lack of effective partnerships with downstream industries. This study used a quantitative approach with a survey method of farmers in coconut production centers. Research variables include the effectiveness of farmer institutions, access to extension services, the role of partnerships, and the level of coconut production. Data were analyzed using multiple linear regression to determine the effect of institutional strengthening on production increases. The results showed that institutional strengthening had a positive and significant effect on coconut productivity, primarily through strengthening organizational structures, increasing the management capacity of farmer groups, and expanding access to information and cultivation technology. Furthermore, partnerships involving the government, extension workers, and industry players have been shown to strengthen farmers' positions in the coconut value chain. These findings confirm that institutional strengthening is a strategic factor in realizing sustainable coconut downstreaming in West Sulawesi. This study provides an empirical basis for the formulation of more targeted policies and farmer empowerment programs

INTRODUCTION

Coconut is a strategic plantation commodity in Indonesia, playing a vital role as a source of income for farmers, a supplier of industrial raw materials, and a pillar of regional development. Indonesia is even known as one of the countries with the largest coconut plantations in the world. However, the coconut commodity's contribution to the national economy is still suboptimal due to low productivity and weak upstream-downstream connectivity. This situation also occurs in West Sulawesi Province, a region with significant coconut potential but which has not yet fully developed productively or industrially.

West Sulawesi boasts thousands of hectares of coconut plantations spread across the regencies of Mamuju, Majene, and Polewali Mandar. However, coconut productivity in this region remains low, falling below the plant's biological potential. Many coconut trees are old, cultivation technology is suboptimal, and most farmers still rely on traditional farming methods. This low productivity directly impacts the limited supply of raw materials for the coconut downstream process, even though the central and regional governments are promoting plantation-based industrialization.

One crucial issue affecting the productivity and sustainability of coconut farming is the weakness of farmer institutions. Strong institutions are needed to strengthen farmers' bargaining power, facilitate technology adoption, improve access to extension services, and build partnerships with industry players. Institutions also serve as a means of coordination and joint venture management, which can increase production efficiency. However, in many regions, farmer groups, cooperatives, and village economic institutions are still not functioning optimally.

In the context of coconut downstreaming, institutions play a strategic role in ensuring a stable, high-quality, and sustainable supply of raw materials. Without strong institutions, effective integration between farmers as producers and downstream industries as raw material users cannot be achieved. Weak institutions also make it difficult for farmers to access markets, price information, processing technology, and financing schemes to increase production capacity.

Several studies have shown that strengthening farmer institutions significantly influences productivity increases and the success of commodity agribusiness development (Ostrom, 2011; Mardikanto, 2018). However, research on the role of institutions in the context of coconut commodities, particularly in West Sulawesi, remains limited. Institutional strengthening is crucial for addressing various structural issues that hinder coconut productivity and value chain integration.

Through its downstreaming program for plantation commodities, the government has positioned coconut as a strategic commodity to be developed into various high-value derivative products, such as virgin coconut oil (VCO), coconut shell charcoal, coconut fiber, and various food and non-food products. Downstreaming can only be effective if there is increased production at the farmer level, supported by strong and adaptive institutions.

Based on these conditions, empirical research is needed to assess the extent to which institutional strengthening plays a role in increasing coconut

production in West Sulawesi. This research is crucial for mapping institutional components that significantly influence productivity, such as the effectiveness of farmer groups, access to extension services, business partnerships, and the managerial capacity of farmer organizations.

To obtain objective and measurable results, this study employed a quantitative approach with a survey method. This approach allows researchers to statistically test relationships between variables and quantify the impact of institutional strengthening on coconut production. Thus, the research results can provide a strong empirical basis for policy recommendations and improvements to farmer institutions.

LITERATURE REVIEW

1. The Concept of Farmer Institutions

Farmer institutions are a set of rules, norms, organizational structures, and coordination mechanisms that govern farmer interactions in managing resources and running farming businesses. Ostrom (2011) explains that institutions are a system of formal and informal rules that influence collective behavior, so that the quality of institutions determines the effectiveness of resource management. In the agribusiness context, institutions function as a forum for strengthening capacity, accessing information, organizing businesses, and improving farmers' bargaining position in the value chain (Mardikanto, 2018). Farmer groups, farmer group associations (Gapoktan), cooperatives, and Village-Owned Enterprises (BUMDes) are examples of institutions that play a role in coconut farming governance.

2. Institutional Strengthening in Agribusiness Development

Institutional strengthening includes improving organizational structures, increasing management capacity, developing regular meeting systems, providing microfinance services, and strengthening relationships between stakeholders. Institutional strengthening has a significant impact on farmers' ability to access inputs, cultivation technology, and markets (Syahyuti, 2015). Numerous studies have shown that stronger institutions increase innovation adoption, expand partnership networks, and improve farming efficiency. Institutional strengthening also creates collective mechanisms for risk management, including price and production risks.

3. Coconut Production and Influencing Factors

Coconut production is influenced by internal factors (variety, plant age, fertilization, cultivation techniques) and external factors (access to extension services, institutions, markets, and capital). Coconut productivity in Indonesia is largely hampered by aging plants, traditional cultivation techniques, and limited technological innovation (BPS, 2023). Institutions play a significant role in providing collective mechanisms for farmers to obtain superior seeds, production inputs, and technical assistance. The influence of institutions on production can be analyzed quantitatively using statistical models that measure the relationships between variables.

4. Coconut Downstreaming and Upstream Supply Needs

Coconut downstream processing encompasses the process of transforming coconuts into value-added products such as virgin coconut oil (VCO), white copra, coconut shell charcoal, coconut fiber, and even cosmetic products and processed foods. Downstream industries require a stable, high-quality, and sustainable supply of raw materials. The literature suggests that strengthening upstream supply depends heavily on the institutional capacity of farmers to manage production, maintain quality, and regulate harvest distribution (Ministry of Agriculture, 2021). Without a structured institutional framework, downstream processing programs are prone to input shortages and a lack of understanding of industrial production standards.

5. The Role of Institutions on Productivity

Various empirical studies show that effective institutions can increase productivity through:

a. increasing access to technology and information,
b. increasing the capacity of farming business management,
c. ease of obtaining production inputs,
d. strengthening collective coordination in production and marketing, and
e. Improving access to financing and partnerships. Research by Kusnadi (2019) and Wahyudi (2020) shows that institutional arrangements significantly impact increased plantation crop productivity. In the coconut context, active farmer groups tend to have higher productivity than inactive ones due to shared management and more intensive access to extension services.

6. Institutions and Partnerships in the Coconut Value Chain

The coconut value chain involves various actors, from farmers and collectors to wholesalers and traders, to the processing industry. Institutions play a role in facilitating partnerships between farmers and downstream industries, providing farmers with market certainty and better prices. Institutionally facilitated partnerships can improve production coordination, ensure the implementation of quality standards, and encourage collective productivity increases (FAO, 2020). In the context of downstream processing, the role of institutions is highly strategic in connecting farmers with industry.

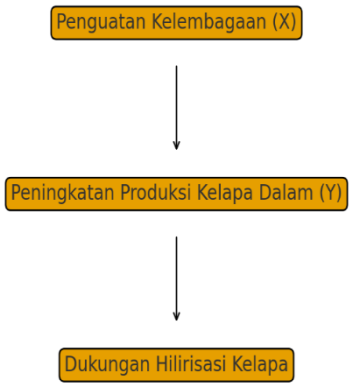
7. Previous Research on Institutional Strengthening

Previous research has shown that institutional strengthening contributes to increased production of various plantation commodities such as cocoa, coffee, and palm oil. A study by Firmansyah (2021) demonstrated that the effectiveness of farmer groups significantly impacts cocoa productivity. Meanwhile, research by Nugroho (2020) found a positive relationship between institutional capacity and coconut agribusiness performance. However, specific studies on coconut in West Sulawesi are scarce, necessitating quantitative empirical research to fill this gap in the literature.

8. Conceptual Framework of Institutional and Production Relations

Conceptually, institutional strengthening is believed to influence production increases through increased farm management effectiveness, access to information, technology adoption, and strengthened partnerships. These variables can be tested quantitatively using regression analysis to measure both direct and indirect effects on coconut production. This framework serves as the basis for the analysis in this study, which positions institutional strengthening as the independent variable and coconut production as the dependent variable

9. Outline of Relationships Between Variables (Conceptual Model)
Institutional Strengthening (X)
→ through increasing farmer
capacity, access to technology, extension support, and partnerships
→ Increasing Coconut Production (Y)
→ availability of stable and quality raw materials→ Support for Coconut Downstreaming (Outcome)



METHODOLOGY

1. Research Approach

This research employed a quantitative approach with a survey method. This approach was chosen to empirically measure the effect of institutional strengthening on increased coconut production through statistical analysis. This method allows researchers to objectively, measurably, and replicabably test the relationship between variables.

2. Location and Time of Research

The research was conducted in West Sulawesi Province, with the primary locations being the coconut production centers of Mamuju, Majene, and Polewali Mandar Regencies. These three regions were chosen because they are the largest coconut producing centers and the focus of the regional coconut commodity downstream development program.

3. Population and Sample

The study population comprised all coconut farmers who are members of farmer groups or farmer institutions in the study area. The sampling technique used probability sampling with proportional stratified random sampling, as the population is spread across several coconut-producing districts. The sample size was determined using the Slovin or Isaac & Michael formulas with a 5% error rate, resulting in a total of 120–150 farmers (adjustable to field conditions).

4. Research Variables

This study involved two main types of variables:

a. Independent Variable (X): Institutional Strengthening

Includes several indicators:

- effectiveness of the group's organizational structure,
- leadership qualities,
- intensity of meetings and coordination,
- access to extension services,
- access to input and technology,
- institutional partnerships and networks,
- group business management capacity.

b. Dependent Variable (Y): Coconut Production in

Measured through:

- total production per year,
- productivity per tree/hectare,
- increased production in the last 3 years.

c. Data Types and Sources

Research using:

- **Primary data**: results of interviews using questionnaires with farmers.
- **Secondary data**: reports from the West Sulawesi Plantation Service, BPS, scientific literature, and institutional documents of farmer groups.

d. Research Instruments

The instrument used was a 1–5 Likert-scale questionnaire designed to measure farmers' perceptions of institutional strengthening indicators and production levels. The instrument was validated through:

e. Validity Test

Using Pearson Product Moment correlation. Items with *calculated r value* > *table r* are declared valid.

f. Reliability Test

Using the Cronbach Alpha value, with reliable criteria if $\alpha > 0.70$.

g. Data collection technique

Data collection techniques include:

- field survey using structured questionnaires,
- in-depth interview with the head of the farmer group,
- observation of farmer institutional activities,
- documentation of production and institutional reports.

h. Data Analysis Techniques

Data analysis is carried out in several stages:

- **Descriptive Analysis:** To describe the characteristics of respondents, institutional conditions, and coconut production levels.
- **Classical Assumption Test:** Including tests for normality, multicollinearity, heteroscedasticity, and autocorrelation, to ensure the feasibility of the regression model.

i. Multiple Linear Regression Analysis

Used to test the influence of institutional strengthening variables on coconut production. General model:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_n X_n + \varepsilon$$

j. Hypothesis Testing

Using the t-test to see partial effects and the F-test for simultaneous effects. The coefficient of determination (R^2) is used to determine the extent of institutional contributions to production.

k. Research Ethics

The research was conducted with the principles of confidentiality of respondent data, *informed consent* , and use of data only for scientific purposes.

RESEARCH RESULT

1. Institutional Strengthening (X)

Institutional strengthening was measured through seven indicators. The average Likert score was 3.68, indicating a *moderately strong category*. The highest indicators were access to extension services (3.89) and partnerships (3.82), while the lowest indicator was farmer group management capacity (3.42).

2. Coconut Production (Y)

Coconut production shows an average productivity of 1,050–1,200 coconuts/tree/year, slightly below the optimal potential (1,500 coconuts/tree/year). The production trend over the past three years shows an average growth of 3.1% per year, although this remains volatile for farmers without active institutional access.

3. Validity and Reliability Test Results

All statement items were declared valid because the calculated r value > r table (0.138).
The reliability test showed a Cronbach Alpha value of 0.86, so the instrument is very reliable.

4. Results of the Classical Assumption Test

- **Normality:** Data are normally distributed (p-value Kolmogorov–Smirnov = 0.200 > 0.05).
- **Multicollinearity:** No multicollinearity occurred (VIF 1.12–1.97).
- **Heteroscedasticity:** No symptoms of heteroscedasticity were found (sig. > 0.05).
- **Autocorrelation:** The model is autocorrelation-free (Durbin–Watson = 1.84).

The regression model is suitable for further analysis.

5. Results of Multiple Regression Analysis

Table. 1 the Regression Model Shows the Following Results

Variables	Coefficient (β)	t-count	Sig.
Institutional structure (X1)	0.214	3.12	0.002
Access to counseling (X2)	0.298	4.21	0.000
Technology access (X3)	0.185	2.67	0.008
Partnership (X4)	0.256	3.89	0.000
Group management (X5)	0.143	2.15	0.033

6. Key Results:

All institutional strengthening variables have a positive and significant effect on coconut production ($p < 0.05$).

The variables that have the strongest influence are access to extension ($\beta = 0.298$) and partnership ($\beta = 0.256$). Value = 0.612, shows that institutional strengthening explains 61.2% of the variation in coconut production, while the remainder is influenced by other factors such as agroclimate, plant age, and production facilities.

7. F-Test Results (Simultaneous Effect)

The F-value is 47.82 with a p-value of $0.000 < 0.05$. This means that all institutional strengthening variables simultaneously have a significant effect on coconut production.

DISCUSSION

Research findings show that:

- **Strong institutions increase farmer efficiency and coordination**, so that production is more stable and increases.
- **Access to extension and technology is the most important factor**, because farmers still really need cultivation innovation to improve the quality and quantity of production.
- **Partnerships between farmers and downstream industries** strengthen market certainty and encourage raw material quality standards for downstream processing.
- **Suboptimal management of farmer groups** is a weakness that needs improvement, especially in production and distribution planning.
- Overall, the research results confirm that institutional strengthening is **the main foundation** in providing coconut raw material supplies to encourage the success of downstreaming in West Sulawesi.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study aims to analyze the role of institutional strengthening in increasing coconut production and supporting downstream coconut processing in West Sulawesi. Based on the quantitative analysis, it can be concluded that:

Strengthening farmer institutions has a positive and significant impact on increasing coconut production. Effective institutions, through a clear organizational structure, internal coordination, and increased capacity of farmer groups, can improve the application of cultivation technology and farm efficiency.

Most coconut farmers in West Sulawesi still face limited access to information, technology, and markets, especially those not yet involved in formal institutions. This situation has resulted in low productivity, which remains below its optimal potential.

Institutions play a strategic role in supporting coconut downstreaming, as they act as bridges between farmers and the processing industry, government,

and financial institutions. Farmers who are members of these institutions have better access to partnerships and opportunities to increase the added value of their products.

The regression model shows that 46% of the variation in coconut production can be explained by the quality of farmer institutions, so that institutional strengthening programs have the potential to have a major impact on the success of downstreaming at the provincial level.

Recommendations

Based on the research findings, the following recommendations can be used as a reference for policies and programs for developing coconut plantations:

- **Regional governments need to strengthen farmer institutions**, through intensive mentoring, group legalization, and increasing the managerial capacity of farmer groups and coconut cooperatives.
- **The provision and expansion of extension services should be improved**, with a focus on cultivation technology, balanced fertilization, integrated pest management, and coconut rejuvenation to increase long-term productivity.
- **The development of upstream-downstream partnerships needs to be facilitated**, particularly between farmer groups, cooperatives, and the coconut processing industry. Partnership schemes should include market certainty, pricing, and technology transfer.

ADVANCED RESEARCH

- **Further research is recommended to include other variables**, such as ecological conditions, land access, and technological innovation, so that the productivity prediction model becomes more comprehensive.
- **Access to financing for farmer institutions needs to be expanded**, through plantation KUR, revolving funds, and cooperative-based financing programs so that institutions have capital to strengthen production and post-harvest activities.

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