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The Design of a Contract Farming Model for Coffee Tree Replanting

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Abstract: Coffee tree replanting is needed in Indonesia, yet a financing scheme is not available at the moment due to its economic feasibility and farmers' reluctance to reinvest. This research aims to design contract farming for coffee tree replanting in Indonesia to support coffee farmer welfare. The method used in this study is Soft System Methodology (SSM), including interviews with several coffee cultivation respondents, with case studies in the Lampung region. The initial study indicates that the replanting program must integrate coffee farmers with banks or investors and coffee processing companies. The study of one farmer community successful in profiting from a new coffee production method enables the possibility of a new model of replanting through contract farming. Aside from banks, institutions that will have an essential role in the development of successful replanting are land owners and exporters or processing companies as offtakers. The implementation of the European Union Deforestation Regulation on traceability will impact Indonesia's replanting effort, as exporters or importers will be accountable for the compliance of their supply chain. The five main factors that need to be evaluated consist of (1) financing as an initial investment, (2) farmer competencies as the farmer's skill to implement the coffee tree replanting, (3) technology to ensure the successful implementation of coffee tree replanting, (4) production to maintain the income flow, and (5) synergy between actors to ensure the role in contract farming development.

Keywords: coffee; contract farming; soft system methodology; replanting

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1. Introduction

Coffee is grown across Indonesia, one of the world's leading coffee producers, contributing to the national economy (Astuti et al. 2015). Coffee industry development creates income and jobs for farmers and other economic actors involved in its cultivation, processing, and exportation activities (Nopriyandi and Haryadi 2017; Murindahabi et al. 2019). As one of Asia's top coffee suppliers, Indonesia produces at least 729 thousand tons yearly, or around 8% of the world's total coffee output (Directorate General of Plantations 2018). This production is divided into 534 thousand tons of Robusta coffee and 194 tons of Arabica coffee. Indonesia can export 60% of its coffee production, while the domestic coffee industry can only absorb 40%; for which, most of the coffee produced is of the Robusta types. The Sumatra region contributes 80% of coffee production in Indonesia, where the green beans come from Lampung and South Sumatra, most of which are lowland Robusta types. This coffee comes from smallholders, reflecting the work of 2 million farmers, who contribute 95% of Indonesia's coffee production. The average coffee productivity in Indonesia, on 1.2 million ha, is around 0.8 tons/ha, lower than in Vietnam. Indonesia's import of green beans and instant coffee by roasters/industry is 100 thousand tons, showing the competitiveness of production costs compared to other countries. Replanting efforts in 2012–2020 in Brazil, Uganda, Nicaragua, Vietnam, and Colombia seek to increase production per ha to improve competitiveness. Coffee in Indonesia still has difficulty competing with several other coffee-producing countries. Indonesian coffee's competitiveness still needs to be higher than other major producing countries such as Brazil, Colombia, and Vietnam (Baso

and Anindita 2018). The quality of coffee commodities is based on several agribusiness activities, consisting of harvesting and post-harvest operations, planting techniques, coffee types, certification processes, physical logistics, human management, social elements, and the geographical aspects of the planting area (Hernandez-Aguilera et al. 2018). However, these factors require an excellent monitoring process to produce adequate quality.

The fluctuating growth indicates a lack of interest in investing in coffee trees or a lack of maintenance during the non-harvest period (Wahyudi and Pujiyanto 2016). This is supported by the farmers being unmotivated to plant new trees in their plantations or to rejuvenate coffee trees that are 28 years old, even though the productivity of these coffee trees has decreased (Rosanti et al. 2020). Coffee farmers' annual incomes are obtained from coffee and other agricultural products on plantations of 2 hectares (ha) and honorariums from non-agricultural activities. Farmers are dependent on the contribution of income derived from coffee plantations, as coffee income accounts for 40% of annual income (Rosanti et al. 2019). Farmers receive proceeds in the range of 84–94% of the price paid by the exporters, the farm gate price ratio of which is considered efficient (Listyati et al. 2017; Aklimawati et al. 2015). The fact that coffee farming is not profitable enough deters farmers and bankers from financing for replanting. Hence, the nexus between contract farming and coffee tree replanting is based on the improvement of coffee farmer welfare due to the lower price ratio.

Upon drying the cherry and removing the skin, farmers will sell it to traders/collectors in the village. Coffee traders/collectors supply to exporters who then determine their preferred supplier or collector, implying that the middlemen could form almost an entire supply chain. Exporters integrate Indonesian coffee into the global value chain by selling to domestic or foreign roasters or trading houses, which subsequently sell coffee to international roasters. Export transactions might absorb 60–70% of Indonesian coffee production, exporting it to the global market via multinational roaster products. Multinationals have financing supports that cover the need for a cash transaction, including purchasing from collectors. Indonesian banks have products to support the exporter transactions, the collectors, and for supporting Indonesian agriculture farmers. Through Presidential Instruction Number 6 of 2007, the government scheme of "Kredit Usaha Rakyat," (Working Capital for the People) or KUR, distributed through banks in Indonesia, supports the financial capacity of farmers.

Multinationals such as Nestlé have tried to improve livelihoods and coffee production through contract farming (Rosanti et al. 2020). Puslitkoka has acted similarly through Metromed arrangements for exporters and farmers (Wahyudi and Pujiyanto 2016), and IDH through organizing industry players to train 500,000 active farmers. The existence of an international trading house with better capital and global logistics gives hope of increasing farmers' livelihoods by providing better prices, more market access, and availability of choices in markets previously dominated by local exporters (Wahyudi and Pujiyanto 2016). Contract growers will receive lower transaction costs, production costs, and incomes. The success of the concept of investment and contract farming is measurable and depends on the satisfaction of all parties involved in the investment and supply chain. This research studied a community-based coffee farmer group, the Kopista community, whose results in 2022 encouraged more farmers to follow their cultivation methods. Kopista increases revenue per ha, with a target of 2000 trees/ha producing a minimum of 2 tons green bean equivalent (GBE) out of 10 tons of cherries, coming to revenue of 38 mio IDR/ha and 76 mio IDR per 2 ha. Kopista's method of cultivation has not been discussed in other literature and has a profound impact on the income of the farmers. With this method, the financial viability of investing in a coffee estate is attractive for farmers, investors, and banks. Replanting is becoming feasible, and contract farming specifying this Kopista method is an indispensable part of the concept of replanting financing. A past study by Rosanti et al. (2019) indicated the revenue coming from 2 ha of coffee is estimated at 35 mio IDR per 2 ha. Coffee farmers with 2 ha have an income of 55 mio IDR: 40% of their net income is from coffee (22 mio/year, after operational costs and transaction costs), and

the other 60% is income from other plants, from honorarium, and other income. Data from Enveritas in the research of Tran et al. (2021) indicate revenue comparable to that of research of Rosanti et al. (2019), based on 2148 trees/ha, the national average, showing that revenue will be 19 mio IDR/ha. All the above are under the assumption of the farmgate price of December 2018, which was 19 mio IDR/ton (ICO robusta 17,000 USD/ton). The financial factor is one of the important factors for farmers implementing the replanting program (Napitupulu et al. 2021). Therefore, the coffee farmer can obtain the proper price and this is associated with improvements to their welfare.

The research also considers the 2024 implementation of the European Deforestation Regulation (EUDR), as the majority of Indonesia's coffee exports go to the European market. The regulation requires traceability of all incoming agriculture products that go into the EU coming from non-forest land. The role of exporters out of Indonesia is to be accountable for the technology and certification involved in ensuring this compliance, satellite monitoring, DNA analysis, and geospatial traceability. With the success of the replanting effort, offtakers will be responsible for absorbing the incremental crops, from 0.5 tons/hectare to 2 tons/hectare, and distributing them to suitable markets or managing suitable products to cater to specific markets. This provides a bigger role for exporters to be anticipated in contract farming cooperation. Contract farming is a form of orchestration that better links production, processing, and marketing (Wang et al. 2014; Ton et al. 2015; Ba et al. 2019; Hank and Priyanto 2018). Smallholder plantations or smallholders receive better seeds and other assistance from plantation companies so they can produce more, which increases income (Bellemare 2010). Transaction costs can be reduced with partnerships and crop quality can be improved (Da Silva and Ranking 2013) as a type of management strategy based on transaction cost theory; partnership transaction costs are considered from ex-ante costs in the form of pre-operational research costs for the selection process, and research costs/price information during negotiations; and from ex-post costs, in the form of control costs and compliance implementation costs, including mediation/dispute resolution fees. Bellemare (2021) also reviewed the literature on contract farming in Asia, producing a selection of smallholders to participate in contract farming, contract design, contract enforcement, and the impact of participation in contract farming.

Most of the studies on the impact of contract farming on some outcomes typically represent welfare interests. Furthermore, Lajili et al. (1997), in their research, used an empirical approach that combines elements of principal–agent theory and economic transaction costs to determine farmer preferences for contract terms in production crops. Farmer preferences for cost-sharing levels, price premiums, and financing arrangements are significantly influenced by the specialization of assets, the uncertainties associated with the case situation, and the selected business and personal characteristics. Rostiar Sitorus (2018) stated that agribusiness companies and farmers in contract farming would play their role as controllers of the entire agribusiness system. Suppose the upstream and downstream divisions are part of the same organization/institution. In that case, it will be easier to guarantee that part of the product components produced will be distributed on time and made according to the specifications desired by the downstream division. Thus, farmers' and agribusiness companies' expectations to enter sustainable contracts can be achieved. Simmons et al. (2005) found that contract farming is designed to minimize the costs of producing certain commodities. Therefore, contracts require in-depth analysis, negotiation costs, maladaptation costs, operational costs, and maintaining good relations with farmers. In the implementation, Hung Anh et al. (2019) also explored the preferences of smallholder coffee farmers in Daklak, Vietnam, for three partnership models (Informal, Intermediary, and Nucleus) without studying the Multipartite and Centralized models, initiating the new contract farming model.

Contract farming can be considered a risk transfer and distribution mechanism. Ideally, contract farming is carried out to reduce the risks both parties face. The contract will reduce the risks the core party faces if it relies on procuring raw materials entirely from the open market. Nucleus companies will also obtain another advantage because

they do not have to invest in land and manage large farms. For the farmers themselves, contract farming will overcome the common problems they face in the risk transfer process (Rustiani et al. 1997). According to Glover and Kusterer (1990), common problems farmers face include competitors adopting new technologies, weak input supply conditions, weak human resources, difficulty accessing credit, limited and unstable markets, and international markets that promise better prices than are able to be reached by small farmers. However, contract farming also invites new risks for farmers, including the monopsony market characteristic in contract farming relations. It will lead to a new dependence from farmers on the core company (Ncube 2020). The development of risk management is also considered to improve the quality of the contract farming model (Adnan et al. 2020). This situation will worsen if farmers do not have the opportunity to diversify their business; for example, to earn income from non-agricultural activities or to produce several types of crops simultaneously, especially if, at the same time, there is also a monopoly in the input market.

There are several previous studies about the design of the contract farming model. Permadi et al. (2017) found the willingness of communities to plant eucalyptus trees to become plasma providers of raw materials in the Company–Communities Partnership scheme. The increase in income is compensation related to the length of the contract period and the amount of time sacrificed to maintain the tree. Thus, the form of contract accepted or rejected can indicate the level of effectiveness of the cooperation program and affect the speed of transformation. Watanabe et al. (2017) state that "Pingado" is one of the important institutions in the contracting model between farmers and agro-industry in a quality-based system carried out in a hybrid form. The study results show that the interactions between the private and public sectors can affect the transaction mechanism in terms of carrying out obligations for farmers in contract farming. The impact of contract farming in coffee production could positively influence the productivity, price, and income of coffee planting activities, impacting national productivity and farmer welfare (Rosanti et al. 2020). The model of contract farming could be integrated with technology. Suroso and Ramadhan (2014a) proposed E-government for Siak local government to improve the smallholder oil palm plantation toward household income. Furthermore, Suroso and Ramadhan (2014b) developed a Decision Support System (DSS) to implement an enterprise's budget, financial projection, and valuation measurement. This DSS can compute fixed costs, variable costs, revenue, and taxation that model enterprise budgets. The importance of contract farming in estate plantations is essential to support the inter-relationship among suppliers, plantations, processors, and marketers of plantation estate (Pahan et al. 2011). Therefore, based on previous problems and the literature, there is a need for a contract farming model for coffee tree replanting. This article addresses a conceptual contract farming model for coffee tree replanting as a program to increase coffee farmers in Indonesia by gathering several institutions to support this model. Furthermore, this model can initiate the development of a contract farming model which can then be adopted by a number of commodities both in Indonesia and in other countries. The demand for this study is based on the consideration of farmer welfare improvement by designing the contract farming model as one of the solutions to implementing it. The gap this research is filling is redeveloping a contract farming model for coffee farmers to solve the income problem.

2. Methodology

This research was conducted for eighteen months in Lampung's coffee agribusiness industry. Apart from being a coffee-producing province, Lampung is also a base for exporters with coffee processing facilities. The research team held meetings based on the results of the Forum Group Discussion (FGD) with a farmer group head, bank, collector, and exporter, to obtain insights on replanting old estates. The research was furthered by collecting data through in-depth interviews with several informants from the 3 largest banks for farmer loans, and interviews with 3 farmer groups in Kopista communities. These actors are important due to their role in our contract farming as coffee funders and

producers. Coffee farmers face the financial problem of coffee tree replanting, which could. be solved if the funder also participated to guarantee them. However, coffee tree replanting can be a solution for farmer welfare improvement. The design of this research uses a qualitative and quantitative mixed-method approach. The research methodology uses Soft System Methodology (SSM) for analysis in this paper. The formulation of cooperation between investors and farmers that can be constructed in the framework of investing in coffee tree replanting is analyzed through SSM, and then analysis later was extended for contract farming. This framework was used to analyze the replanting model through investment contracts, starting from stage one (analysis one) to the analysis of five of the seven stages of SSM (Checkland and Poulter 2006). The SSM methodology is based on seven stages, from clarifying an unstructured problem situation to designing a human activity system that is expected to help improve the situation. This conceptual model is then compared with the problem situation to identify possible changes. There are several steps (Figure 1), and their descriptions are as follows:

1. Making Rich Picture (RP) Stage 1: Situation Considered Problematic: the intended problem is more appropriately called a problem situation because more than one problem must be solved. Thus, it is necessary to identify them one by one. At this stage, data were obtained from both secondary data through a literature review about contract farming models and primary data obtained from direct interviews or by distributing situational analysis questionnaires about the regulation about coffee, the current replanting program, and the condition of coffee farmers in Indonesia. Stage 2: Problem Situation Expressed: data and information were collected by conducting observations, interviews, workshops, and discussions/focus group discussions followed by the formulation and presentation of these problems, which are then outlined in the form of a Rich picture.
2. Creating a Root Definition (RD) Stage 3: Root Definitions of Relevant Systems: we linked the problem to the existing system, followed by creating root definitions that explain the process/transformation to achieve the goal (To do X, by Y, to achieve Z) to test the root definitions by performing CATWOE analysis, classified into: (1) C = Customers: the victims or beneficiaries of Transformation, (2) A = Actors: those who undertake Transformation, (3) T = Transformation: input–output, (4) W = Worldview: which makes the Transformation meaningful in the context, (5) O = Owners: those with the power to stop Transformation, and (6) E = Environmental: elements outside the system in which constraints are taken as a given.
3. Develop a Purposive Activity Model (PAM) Stage 4: Conceptual Models: creating a conceptual system model for each system. The model is described by an activity model, followed by determining and measuring the performance model (efficacy, efficiency, and effectiveness). Stage 5: Comparisons with Reality: comparing the conceptual model with reality, and usually, new ideas for change will arise through face validity. Stage 6: Debate about Change: together with stakeholders, the results of the previous stages are discussed, the result is changed, and the change must be systematic (means and goals) and feasible to implement. In orders one, two, five, six, and seven are the real world, while in orders three and four are systems of thinking about the natural world; Stage 7: Action: take initial corrective action to improve the situation.

In this research, we compiled these stages into three steps: (1) Stage One SSM: Identification of problematic situations (Situation Considered Problematic), (2) Stage Two: Rich Picture Transformation of the form of cooperation built within the framework of investing in coffee tree replanting, and (3) Stages Three, Four, and Five of SSM: Root Definition, Purposeful Activity Model (PAM), and Comparison with Actual Implementation.

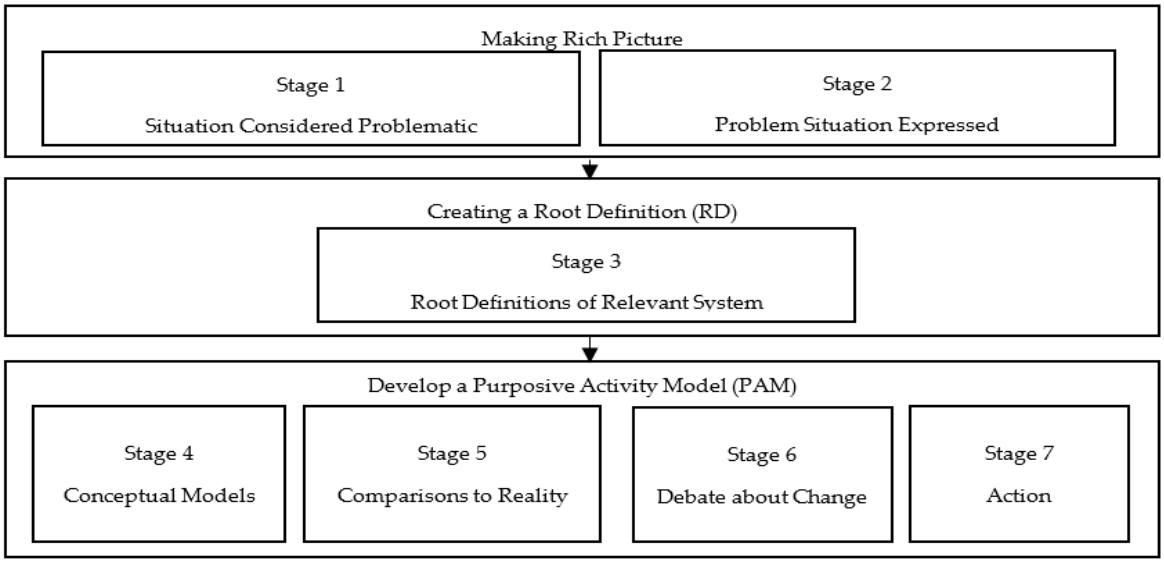

Figure 1. The Steps of the Soft System Methodology (SSM).

3. Results

We identified and dug deeper into the problematic situation related to contract farming activities in coffee plantations. In this stage, researchers are expected to recognize the situation, formulate, and take action to improve the problematic situation. The first step was to picture the performance of the coffee plantations, the problems encountered, and the conditions under which contract farming was carried out. The next step is to map out any critical issues or problems that could threaten the sustainability of contract farming for coffee tree replanting investment. The output of this stage is a rich picture of the problems faced. The next stage is to design root definitions for contract farming stakeholders for investment in coffee tree replanting with CATWOE. The output of this stage is the formation of a contract farming direction for investing in coffee tree replanting.

3.1. Stage One SSM: Identification of Problematic Situations (Situation Considered Problematic)

Initial FGD was conducted with key persons representing stakeholders involved in financing activities in the coffee supply chain, replanting, and contract farming: banks, coffee farmers' group heads, collectors, and exporters. In identifying the problematic situation in contract farming activities for investing in coffee tree replanting, in-depth interviews with key persons and other stakeholders have been conducted further, so as to describe how this analysis evolves. In identifying situations related to the cooperation model that was built in the context of financing the existing and new coffee estate, it was concluded that an overview of problematic situations in the scope of coffee supply chains was based on the results of interviews, namely:

1. Weather is the main risk that can hamper farmer productivity. There are still problems that cannot be handled by farmers, namely excessive rainfall, difficulty in fertilizer availability, and problems related to insect or fungal attacks.
2. The income earned by farmers is still lower than the regional minimum wage and wages in big cities, so the children of farmers are not motivated to return to the estate.
3. Banks provide financing in terms of Kredit Usaha Rakyat (working capital for the People)/KUR. This mostly is anticipated in the three months before harvesting, both for the needs for their estates: for labor, infrastructure, production time, materials, and equipment requirements, for their fertilizer, and also when they are harvesting: for harvest processing and transportation. In this period prior to receiving cash, their credit line is already optimized. During the off-season (after harvest), farmers sometimes have sudden personal needs uncovered by KUR. In these circumstances, they go back to personal loans. These loans are usually repaid at harvest time by

handing over harvested coffee as payment. (Sometimes the quality of the coffee is not stable because of the rush of time, or because farmers do not wait for ripe coffee conditions in order to harvest quickly for sale).

4. Viewed from the collectors' side, the problem that arises is that sometimes the company is short of cash when harvesting. While the majority of collectors are, on average, on a cash and carry system, some mismatches in slow sales and big purchases cause cash lag.
5. At the exporter level, there is a financing mismatch between incoming money and outgoing goods. Many export contracts are delayed due to logistical problems. The goods are already in the warehouse ready for export, but the problem is that the delivery is still delayed due to container problems. The payment to collectors requires huge funds.

According to informant 1 (exporter), the structure of contract farming with farmers/coffee estates so far includes several actors who are considered competent so that the program can run, where the collectors involved are already regular suppliers to the exporter. Apart from traders, or collectors, farmer groups have also started to be involved.

> "To ensure that the actors involved have interest and motivation. The company carries out mentoring activities, where the assistance is not only in the form of an educational program for farmers, because for coffee problems farmers are certainly more expert. However, sometimes problems still arise that they cannot overcome, such as when harvesting there is excessive rainfall, there are difficulties with all kinds of fertilizers, problems related to insect or fungal attacks" said informant 1.

Apart from financial problems related to cultivation, usually during the off-season after the harvest is finished, farmers have sudden needs. If no solution can be offered through banks, they will return to obtaining personal loans. The loan is usually repaid at harvest time with the delivery of coffee as payment. Aside from obtaining fertilizer to increase production, this personal loan caters to the convenience of farmers as an easy, informal process. There should be a solution that covers the safety of the bank regarding repayment of loans given to farmers, the need of the companies for the supplies, and the certainty of farmers finding a buyer after investing in fertilizers.

According to informant 2 (bank), when viewed from the finance side (bank), the hope is, of course, that it can help farmers, so they do not have problems when rejuvenating, not only in terms of financing but maybe also in cooperation related to the agency for farmers, their transactions, and their potential. From the bank side, the mentoring process can run with the help of technology, which requires the cooperation of all parties in the digitalization process. Meanwhile, regarding financing, farmers sometimes have certain moments when they need financial support. Informant 2 added that farmers might be wealthy in October, November, and December. However, in periods beyond that, they need capital for their estates, labor, infrastructure, production time, materials and tools, fertilizers, harvesting, processing crops, and transportation. The amount is insignificant, and the repayment period is quite long compared to when the farmers had excess money.

Another problem that must be faced is that many export contracts are delayed due to logistics problems. The goods to be shipped are already available in the warehouse for export. However, the delivery is delayed due to problems related to the availability of containers and the shipping space used. Several suppliers have preferred status (around 80–90% ship goods to the company concerned), but the problem these suppliers face needs to be clarified. The goods entered the warehouse during the harvest, and the product was ready for shipping but delayed due to the availability of shippers worldwide. The company experienced a delay in payment which then slowly affected these collectors.

> "In this case the underlying problem is the cash and carry system, where if cash is available then supply can be obtained. Sometimes this lag that we keep happening every year is the problem, at harvest time we have logistical problems,

> we export there are obstacles. So that in the end this cash lag occurs which sometimes becomes a difficulty for suppliers as well. Therefore, the help of financial institutions is needed to support the availability of cash for farmers" said informant 1.

From a supply perspective, they also need cash and carry support at harvest time. There is a financial mismatch between incoming money and outgoing goods.

> "Sometimes there is also a difference. The supplier's situation is that he needs fast turnover, wild cash rush. As for the supply of farmers they may be interested, but there is a risk of crop failure" said informant 2.

Informant 3 (farmer group) said that in the process, farmers make deposits to collectors. It is known that when the company processes the financing, the closed loop does not occur. There is a need for more in-depth monitoring.

> "In the field, there are different realities. If the partners are not well connected with the farmers, the farmers can sell to other people (side-sell). On the other hand, what farmers give to the middlemen or collectors sometimes cannot be paid fast, because he can't absorb the existing supplies. This is problematic" said by informant 3.

As for investing in new coffee estates, according to informant 1, the strategic issues that have been carried out in realizing an effective cooperation model are related to the existence of assistance activities for farmer groups, where the training program is not to educate technicalities to farmers, as farmers are experts on coffee issues.

> "Apart from that, it needs to be implemented regarding our Millennial Smart program and I think this will also be quite interesting to collaborate with bank is also proclaimed to be able to work with one of the smallest segments of the scope of the cooperation model by hooking up to the upstream segment or sector are assisted farmers" said informant 1.

Informant 2 said that the strategy that has been implemented in increasing productivity is by recruiting young, technologically literate farmers, specifically millennial farmers. Furthermore, there is an explanation that, ideally, the provision of KUR is given in the period from January onwards, as these farmers need funds, and that maybe KUR presence in December is the right time. The benefits are evenly distributed to farmers so that the working capital needed for planting in the 2022 period can be met quite well and quite easily from the bank. During the maintenance period, farmers are not charged with monthly obligations. As for the things that need to be undertaken and added to realize the model of cooperation built by investors and farmers in the framework of investing in coffee tree replanting according to source 1, there is a need to focus on young farmers.

> "Where young farmers are more open minded, they know more about all kinds of technology, so the hope is that they will become Millennium farmers who are different from their parents. Banks definitely need security too, right? We also need supplies. Farmers also need certainty, right? How can we collaborate on this issue?" said informant 2.

Informant 3 explained that digitalization needs to be added to the investment cooperation model is actually expected from the bank's side. The implementation of this financing assistance can run with the help of technology, so it is necessary to explore the digitalization process. The government is always behind MSMEs and supports MSMEs to have a contribution and have resilience in national economic recovery. There is a need to increase the Micro, Small, and Medium Enterprises (MSMEs) in the Digitalized Agriculture National Economy, where banks are trying to develop one of the backbones of the economy by exploring this together with the matching businesses to this opportunity. The hope is that with the assistance of cooperation with coffee-producing companies, the bank as a

financing institution can also contribute positive synergies. The stakeholders involved in making this happen are processing companies that most need Robusta coffee.

An interview with a farmer group in the Kopista community demonstrates that Robusta production under the Kopista method is promising. The method of the Kopista community in West Lampung has updated how they care for old trees and how to plant new trees, which can increase coffee production to a minimum of 2 tons/ha, resulting in improvements in farmers' minimum incomes. The objective of the maintenance of old trees is to have 20 branches, 8 clusters, and 25 red fruits/cluster, and each tree produces 1 kg of coffee/bean. The productivity level of young coffee trees can reach 1.3 kg/tree with 20 twigs or 2.7 kg/tree with the development of 40 branches and two doses of fertilization. The new estate developments of the Kopista Community are based on the assumption of increasing the density from 2000 trees to 3000 or 4000 trees. The maintenance system under Kopista differs from conventional planting cultures by considering: (1) the number of twigs, clusters, and the calculation of coffee flowers at an optimum level that maximizes nutrients at the following harvest, (2) pruning patterns allow estates without other plants, so that the number of trees can be reduced, preventing competition for nutrients, and (3) monoculture patterns without intercropping with other plants reduces the risk of pests or adverse effects on nutrients.

Farmers in the Kopista community are excited to see the result of fellow farmers who successfully implement the method. The problem with replanting in existing estates is that farmers need to pull out old trees and replant new trees, which will cause them to lose income for three years, which they cannot afford. Some farmers capable of buying new land are planning to replant using the Kopista method. Most farmers under Kopista are using the Kopista method for the maintenance of old trees, row by row, to balance the risk of pruning, as the Kopista method is contradictory to the conventional pruning method. Interviews with the farmers also demonstrate the eagerness of the farmers to increase their trading capability to supply to the exporter. Some equipment such as weight balances, hygrometer, etc., still to be fulfilled, in order to ensure each batch of delivery is contract-compliant in terms of weight and moisture content. The farmers also displayed trust in the group leaders who advise on the type of certain seeds to be used in each growing area in anticipating local conditions and climate change. In terms of financing, the young farmers have not applied KUR for working capital, investment in replanting, or acquiring new land.

Interviews with three state-owned banks providing the majority of KUR in Indonesia demonstrate that replanting carries certain risks, as farmers do not have income for the first 3 years of replanting. Collectors are also unwilling to invest jointly with the farmers, or invest by themselves, in the replanting program. Collectors are also reluctant to provide loans to farmers, as the repayment has not been well fulfilled; however, to maintain the farmers' supply, collectors provide some tolerance to select farmers. Banks, in separate interviews, display a willingness to provide KUR and to provide investment loans, as long as it is financially feasible and the exporter is available as an offtaker. The collectors will act as agents for collecting repayment through a deduction of the proceeds of harvest. Each bank has its own approval/referral mechanism and repayment mechanism in ensuring repayment. In all three banks, collateral is not required for KUR, but for investment in new estates/purchasing new land, all banks require collateral in terms of land certificates, which is also a problem. Some farmers do not have the type of land certificate acceptable as collateral, nor wish to give a land certificate as collateral. One bank has a scheme of a grace period of having no installments nor interest payments in the 3 non-productive years, but with a higher interest rate than that of KUR. Two other banks do not have a scheme yet for this grace period. None of the banks has a grace period policy and a non-collateral policy. The most difficult of all is that the feasibility of a new estate is not achievable with KUR's low-interest rate based on the national average production. The results of interviews in the field show that new estate development can be carried out by some farmers who already own 3 to 6 hectares of family land. The existing financing scheme used for land

expansion is a personal loan between the established farmers and land owners based on trust, in which payments are made in two stages. The buyer submits a down payment of 50 million IDR to the land owner and pays the remaining 50 million in installments or at the following harvest.

Halket and Vasudev (2014), in their research on housing and land payment schemes, said that a high down payment for a house or land is a type of risky purchase due to the nature of assets that are illiquid and lack mobility. Therefore, Kozhaya (2020), in his research, suggests a contract farming model for farmers, which has a positive and significant effect on economic welfare and reduces rural poverty due to several policies that will make it easier for industry players to participate in contract farming. Contract farming is a way for the private sector to take over the role previously served by the government in providing information, input, or credit to farmers in developing countries. According to the farmer with ten years of experience in the agricultural industry, there are differences for parent companies in managing finance for contract farming. The first company carries out a transaction type by providing a class system for contract farmers based on the length of work and achievement of targets, then provides intensive presence of farmers, guarantees seeds to farmers, and guarantees prices that farmers can afford. At the same time, the second company takes transformational actions by empowering the farmers themselves by providing field assistance, monitoring farmer performance, and providing fertilizer certainty and an understanding of clones to contract farmers.

The results of the interviews show that entrepreneurs in the field of exporters or traders can finally guarantee the availability of fertilizer to farmers in the framework of contract farming before farmers dare to commit to replacing old trees with new trees. Based on the results of field interviews conducted, the scheme for applying fertilizer to contract farms begins with farmers preparing new shoots for the following year and conducting land clearing. Then, farmers are given 250 kg of fertilizer twice during the planting season. The types of fertilizer available provided by the company include: NPK fertilizer, urea fertilizer, and KCL fertilizer. In another interview with a farmer, some farmers have managed to purchase the fertilizer themselves and proved that the income outweighed the cost of additional fertilizer.

The government supports financing for farmers in Indonesia through the KUR, launched in November 2007, based on the issuance of Presidential Instruction Number 6 of 2007. The purpose of the people's business credit is a form of government support to expand access to Micro, Small, and Medium Enterprises to enjoy bank credit and increase production in the real sector in Indonesia. Regulations regarding KUR also develop dynamically, in line with changes in the direction of economic policy in Indonesia, results of policy evaluations deemed ineffective, or social and economic changes in society due to external factors such as the spread of COVID-19. Some of the farmers interviewed used a financing scheme from KUR, channeled through one of the main banks in Indonesia with a loan of 25 million IDR with flexible loan terms, namely between 12 months, 18 months, and 24 months. The KUR facility is also free of administration and provision fees. In addition, the interest rate applied by KUR is relatively low, namely 6 percent per year. The in-depth interview provides further insight as follows:

1. The Kopista community will be able to improve productivity on existing estates and will be able to replant with higher density and higher productivity of new trees. The investment of new land will be viable by achieving the minimum target of 2 tons/ha.
2. Farmers have to invest on their own for new estates and rely on personal loans or banks, as the parties in the supply chain will not participate in investment in the estate. The banks will need to work with the collateral of the farmers. At the moment, there is also no available product suitable for farmers' coffee replanting plans.
3. Banks work with collectors and exporters to ensure supply chain integration and risk management. The repayment mechanism can serve as a starting point for digitalization, which will assist in accountability. The need for farming equipment and

fertilizers can also be opportunities for new business and serve as tools to monitor certainty of growth and, in the end, repayment.

3.2. Stage Two: Rich Picture Transformation of the Form of Cooperation Built within the Framework of Investing in Coffee Tree Replanting

After identifying the description of the problematic situation, the framework of thinking is dissected by considering activities between stakeholders considering the problematic situation, thus the goal of this discussion could be achieved. In line with what is formulated in the research method, the researcher will formulate a Rich Picture, which aims to help show relationships and judgments, use symbols to express situations, and indicate relationships that are relevant to solutions. According to Checkland and Poulter (2006), an excellent rich picture must be made as follows:

1. Identifying the concepts and ideas being studied;
2. Using symbols or icons that depict the ideas of SSM practitioners;
3. Connecting lines between concepts and main ideas accompanied by a brief explanation if necessary.

Based on the rich picture of the problematic situation in Figure 2, the stakeholders involved in coffee replanting, in the long run, need the Government of Indonesia through the Financial Institution, the Agency in charge of plantations in Lampung, and the Research Institute, aside from coffee business actors in Lampung. This model is workable due to integration among stakeholders who can support the improvement of farmer production and welfare through intervention and mentoring based on some previous studies (Sriboonchitta and Wiboonpoongse 2008; Ncube 2020). Our model concentrates on the role of non-price factors, such as higher productivity, the improvement of farmer quality, and funding viability, which is in compliance with Prowse's (2012) finding. The coffee farmer is an important actor to support this collaboration through their essential role from other actors. The strategy carried out is financing coffee tree replanting by collaborating in the form of mentoring. The offtaker requirement is the cooperation model already discussed, with the latest adjustments to enable investment. Contract farming employing the Kopista method could cause a significant improvement in profits. This model requires cooperation through banking as a differentiation, as in a study by Li et al. (2015), which constructed a crop rotation model by integrating farmers and investors. The specifications of the contract farming model by Melese (2012) are duration, contract quota, grading system, quality control, delivery time and condition, logistic support risk, and profit-sharing systems.

The common situations currently being faced by farmers are erratic rainfall, the availability of fertilizers, and the appearance of vermin. In terms of financing, the model needs to address financing facilities for farmers, considering bridging loans and investment loans. Security of repayment can be improved by digitalization, which also improves the traceability required by the EUDR. Collaboration between companies and farmers in contract farming is necessary to achieve the desired goals. An increase in productivity and quality yields can impact farmer incomes through application of digitalization-based agricultural SMEs.

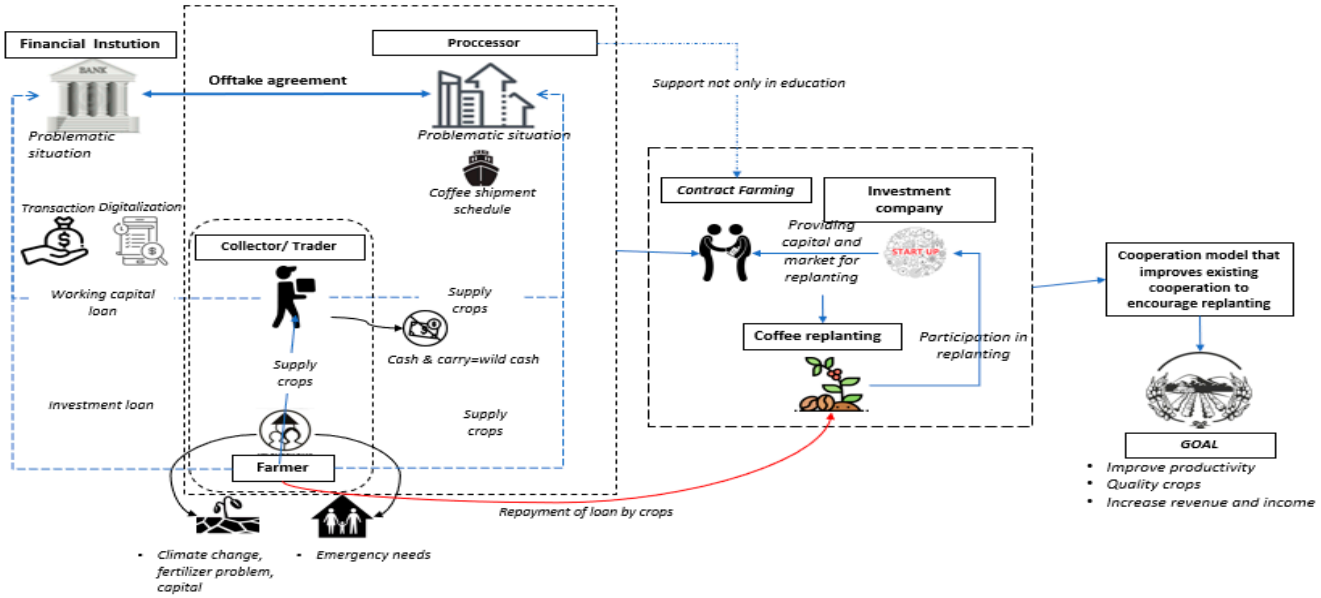

Figure 2. Rich picture research.

3.3. Stages Three, Four, and Five of SSM: Root Definition, Purposeful Activity Model (PAM), and Comparison with Actual Implementation

SSM's third and fourth stages are determining the root definition (RD) and creating a Purposeful Activity Model (PAM). Root definition is a clear statement about the activities that occur or may occur in the coffee plantation being studied. This root definition is based on information about cooperation built within the framework of investing in coffee tree replanting—preparation of the root definition using the PQR formula. Constructing relevant human activities in SSM indicates that the research has entered the system-thinking stage. System thinking consists of two stages. First, we determine the root definition. Root definition is a system relevant to the problem system under study. Root definition is also a tool for creating a conceptual model. According to Checkland and Scholes (1999), the root definition can also be said as a brief verbal definition of the nature of the activity system that is intended and considered relevant for exploring problem situations. The root definition must follow the PQR formula: "a system to do P by Q in order to achieve R" (Checkland and Scholes 1999) or "do P, by Q, in order to help achieve R" (Checkland and Poulter 2006). This root definition was developed and finalized by CATWOE and then followed by performance measurement criteria using 3E (efficacy, efficiency, and effectiveness). In practice, the criteria for measuring performance using the 3Es have also developed into criteria for measuring performance using the 5Es (efficacy, efficiency, effectiveness, elegance, and ethics).

Second, we create a conceptual model by constructing a model based on a purposeful activity system. The conceptual model (conceptual model) is a model that describes system activities, with the elements as verbs. The activity is based on the root definition, and the structure of the verb refers to the logic base. Each model is relevant to the situation, but that does not mean that the model represents the situation. The root definition is prepared using the general PQR formula: working on P with Q to realize R. The PQR analysis formula is obtained as follows: model formulation of the form of cooperation built by investors and farmers in the framework of investing in coffee tree replanting (P), through contract farming as financing prerequisite (Q), to achieve productivity and improve coffee quality (R). As for contract farming as a subsystem, the model aims to build a strategic offtaker–farmer relationship (P) through a mentoring program (Q), in order to achieve financial goals and financing viability (R). Furthermore, the root definition obtained will be used to make a conceptual model.

The root definition obtained is tested and refined with the CATWOE analysis tool to describe a selected relevant human activity system. In order to find out the formulation of the form of cooperation, we built the framework of investing in coffee tree replanting and defined each group's role in an approach called CATWOE (Client or Customers, Actors, Transformations, Worldview, Owner, and Environment Constraint). The identification and analysis of CATWOE are based on the results of the complex situation analysis (Table 1). We then determined the critical sub-elements of each element as a basis for building a conceptual model based on situational analysis, discussion with experts, and understanding of researchers, then the results were obtained. In developing effective cooperation models, increasing farmer innovation, financing programs, increasing production, and increasing team member welfare, actors need an understanding of increasing competence, innovation, clarity of financing regulations, and availability of financing, which must be built jointly by actors in cooperation. It is essential to support the improvement of the contract farming model for investment in coffee replanting.

1. For financing reasons, an offtaker is needed in feasible investment activities;
2. Establishing contracts and financing programs for farmers;
3. Increasing farmer capability, competency, and innovation;
4. Anticipating cultivation problems and extreme weather;
5. Improvement of logistics systems and supply chain distribution in the coffee industry.

Table 1. CATWOE Criteria.

Symbol	Note
C—Customers	The parties who benefit or "can" become victims of the model formulation of the form of cooperation built by investors and farmers in the framework of investing in coffee tree replanting
A—Actors	Farmers, collectors/suppliers, coffee production companies, exporters, investors, financing institutions
T—Transformation Process	The process of transforming the cooperation model built on coffee plantations through the latest adjustments in order to increase innovation, so that farmers receive proper financing to carry out production activities to increase farmers' welfare
W—Worldview	The creation or realization of an effective cooperation model must be supported by strong financing, because it includes production activities on coffee plantations
O—Owners	The parties that can or have the power to stop or change the T process, which in this case are the production company and the government
E—Environmental Constraints	The constraints of the system are beyond the scope of the model, which in this case are regulations and the inaccuracy of KUR being implemented in Lampung coffee plantations

Compared with other studies, this model has a similar benefit to a previous report by giving higher profit sharing to the farmer. However, this model does not keep the cost of input activities. It differs from the study by Dhillon and Singh (2006), who analyzed the Nijjer Agro Industries Model by guiding the firm to fertilization and the timing of sprays, as well as providing technical advice regarding grading and quality control. Our model could support food security through the surplus production of coffee, increased income, and the enlargement of other income, like the study by Jagri Binpori et al. (2021).

The conceptual model in Figure 3 is formed as a new ecosystem that is structured with activities that are currently happening and has a purpose in real-world thinking that can adapt to external/environmental changes. The line in Figure 2 indicates the linkage of one activity performed and its implications to other activities. This model is

also similar to common contract farming, indicating that it can be implemented as contract farming in coffee and has been shown to result in increased well-being (Rosanti et al. 2019). Furthermore, the implementation of the replanting method will be based on the Kopistas community, referring to Karjo (2023). The feasibility analysis by Haryono et al. (2023) shows that the Kopistas model (3000 coffee trees) provides a short payback period value with higher NPV than conventional replanting (2000 coffee trees). The density and stem method are found in cultivation practice in Arabica and Robusta; however, 3000 trees–4000 trees are found in numerous studies in new trees in Ghana, Uganda, Colombia, etc. (Tran et al. 2021; Piato et al. 2020). This model also provides direction and strategy for regulators, investors, farmers, and other actors to achieve a contract farming model for optimal coffee tree replanting investment.

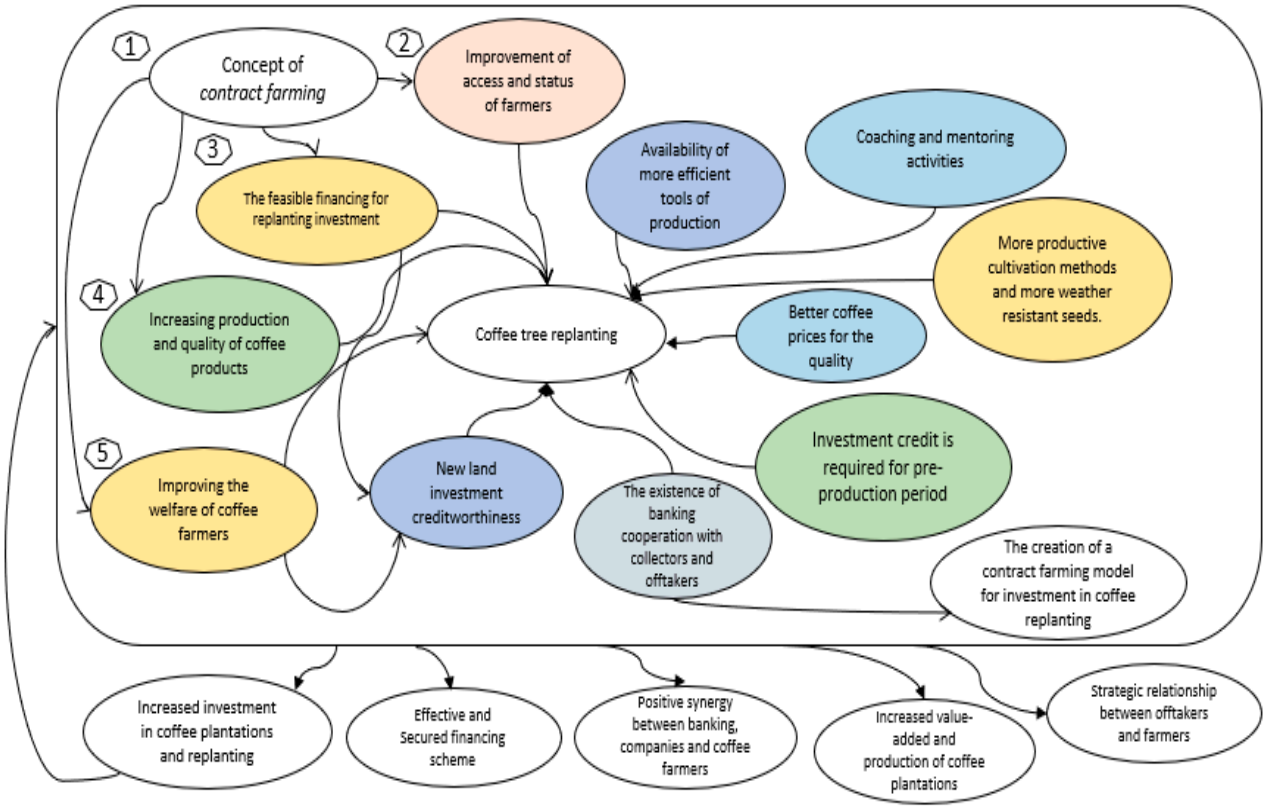

Figure 3. Conceptual Model. Number 1 reveal the main design of contract farming in coffee replanting with four main objectives (Number 2 until 5).

The worldwide view of this system is that the creation or realization of an effective collaboration model must be supported by solid financing because it includes production activities in coffee plantations. However, our model (the Kopistas method) excluded climate change coping and adaptation in coffee tree replanting. The actual implementation must be supported by mitigating climate change as one of the impacts of the contract farming model (Azumah et al. 2017). The restructuring of agricultural production comes from the implementation of contract farming, drawn up to source raw produce for the factory, which led to radical shifts in control over land and water resources (Veldwisch 2015). The criteria for measuring the performance of purposeful activity systems generally use the five criteria in Table 2.

Table 2. Criteria for measuring the performance of the activity system.

5 E's:	Note
Efficacy	Realizing a cooperation model that is supported by strong investment and financing in contract farming activities.
Efficiency	Carrying out cost efficiency in the supply chain sector as well as optimization and efficiency to provide appropriate and inexpensive distribution costs.
Effectiveness	Realization of contract farming with financial support to farmers who are concrete (regulated), transparent, and accountable.
Elegance	The design of a contract farming scheme for investing in coffee tree replanting has a positive impact on farmers, exporters, investors, regulators, and the entire supply chain.
Ethicality	The research results can be used as a reference and implemented in the coffee plantation sector.

We also make comparisons between conceptual model activities and conditions in real situations with implementation or activity gaps requiring change. We evaluate five main factors such as financing, competency, technology, production quality, and synergy between actors. The following is an explanation of each of the factors:

1. Financing

The conceptual model built is expected to be a support system for operational activities starting from the nursery stage and maintenance until harvest. Adequate financing is needed for coffee plantation production activities and for sustaining farmer household needs for the 3 immature years of the estate. In real-world conditions, the current KUR scheme is not effective in implementing the contract farming model due to the insignificant impact on the feature of KUR being difficult for small-scale farmers to access (Suhartini et al. 2021). The financing scheme used for land expansion is still in the form of a personal loan between parties, and replanting has not been accommodated for investment loans. KUR, which is a closed loop, binds collectors prior to the main traders or off-takers. We found several improvements such as: (1) the KUR process must be improved by ensuring farmer group members are committed to increasing production, (2) developing new land investment loans, and (3) a system for monitoring repayment through the value chain.

2. Competencies

The conceptual model built is expected to encourage agriculture entrepreneurship competence and farmers' production methods. This can have implications for increasing the welfare of coffee farmers. In real conditions, there is more complex assistance, not only in the form of educational programs. There are some considerations such as (1) the need for support from all parties so that farmers can compete in the export market, (2) increasing the productivity of estates in the immediate future.

3. Technology

The conceptual model built is expected to support farmers to better adapt to the digitalization era. In the real world, increasing productivity is undertaken by recruiting young, technology-savvy farmers. Farmers have limited access to technology due to low interest, demands, and outreach to farmers. This is also complicated by the existence of a mindset that the need is still for conventional farming, as well as difficulties in accepting digital transformation. There are some considerations such as (1) there is a need to upgrade the infrastructure and the MSME for the Digitalized Agricultural National Economy, (2) working on digitizing all business transactions from upstream to downstream, (3) support for seeds of suitable coffee variety, and (4) conventional farming tools are still needed in farming operations, such as weighing, drying, and fertilizer.

4. Coffee Production

The conceptual model built is expected to produce a quality crop. In the real situation, farmers have a dependency on the company that shelters them, so that their yields are in accordance with the standards. The company still accepts a quality of coffee production that does not meet the necessary quality. During the off-season, farmers usually rush harvest time without waiting for the coffee to mature, so the quality of the coffee is unstable. There are some considerations such as: (1) the superiority of non-conventional cultivation methods needs to be promoted and adopted, (2) cooperation between the offtaker and farmer in the form of contract farming guidelines needs to be detailed in order to achieve the investment goals.

5. Synergy between banking, smallholder, and company

The conceptual model built is expected to create a contract farming model for investment in coffee replanting, which in the end provides security to the banking system and investors. Currently, the relationship that exists between the company and coffee farmers is related to aiding farmers. At the moment, the banking sector manages loan disbursement and the collection of payments through KUR and investment loans. The financing sector only takes care of the portion of lending funds to farmers through the People's Business Credit (KUR). There are several considerations such as: (1) synergy from all parties, the bank increases its security, certainty to produce as targeted in the investment scheme, assurance for the farmers to produce and to sell as expected, (2) the financing sector provides support not only in terms of financing, but also related to agency and transaction management, to provide accountability for investors.

4. Conclusions

This study aims to achieve higher production in coffee replanting programs, where banks will provide investment loans to farmers and exporters as off-takers will assist in absorbing the production target. Our research question is how the proper design of the contract farming model for coffee tree replanting accelerates coffee farmer incomes in Indonesia. Coffee tree replanting is one of the important activities for coffee farmers to expand their incomes. In addition, replanting can maintain coffee farmer productivity in order to gain a stable income through high production. However, there is potential for coffee production to increase smallholder welfare, and the task of sharing risk and achieving common goals will be managed by the contract of multiple parties. Contract farming is a potential solution to overcome agricultural production constraints on limited farmer resources and land ownership constraints by companies, which is then developed by various models depending on stakeholders' level of coordination and involvement. In the case of Lampung, we noticed that the stakeholders involved in the coffee replanting model must include the Government of Indonesia, the plantations agency, the research and development institutions, and coffee business actors. It is necessary to encourage farmer participation in contracts and financing programs; increase farmer capability, competency, and innovation; anticipate cultivation issues and extreme weather; and improve logistics systems and supply chain distribution in the coffee industry. There are five key factors, namely: (1) financing, (2) competencies, (3) technology, (4) coffee production, and (5) synergy between banking, company, and smallholder. The managerial implication of this result is that design contract farming could be an option for policy-makers to develop a system to gain a win–win solution between producer and investor. This model can guarantee benefits for farmers in terms of developing production capacity, one of the main obstacles for farmers, including those of coffee.

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