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Developing rice granary in an upstream area of the Brantas River of east Java, Indonesia

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Abstract

This article examines the implementation of the Green Revolution policy in the Kepanjen District, Malang Regency, from 1969-1998. The Kepanjen District is one of the major rice-producing areas in Malang Regency, so it has become a rice granary for East Java. The problems to be dealt with here are the supporting institutional arrangements and dynamics of the Green Revolution program implementation. This study used the historical method and agricultural economics approach. The background to implementing the Green Revolution was the food crisis in the 1960s that occurred in the country. The New Order regime launched a green revolution program to overcome the crisis. The program was implemented in 1969 with *Bimas*, *Inmas*, *Insus*, and *Supra Insus*. Mass guidance, agricultural counseling, and village cooperatives have been the significant institutional support for the program. In promoting rice production, the farmers had to fight against the attacks of pests and diseases that sometimes caused extensive harvest failure and big losses in particular years. Despite the difficulties, there was a general trend of increasing rice production under the Green Revolution. As rice production grew, the farmers also experienced a significant growth in income and a better standard of material living.

Keywords: Kepanjen district, rice production, green revolution, Brantas upstream area

Introduction

Under the New Order government, Indonesia has recorded an impressive achievement. From a sizeable rice-importing country in the 1960s, Indonesia reduced its dependence on rice imports and even transformed into a country capable of being self-sufficient in rice in 1984 (Van der Eng, 1996:190) ^[31]. The achievement has been internationally recognized, including by the Rome-based Food and Agriculture Organization of the United Nations (FAO). Indonesia won the awards and defeated its two major competitors, India and China (Margana, 2010:251) ^[21].

The success story of the New Order's Green Revolution has attracted scholarly interest to examine various aspects of the program. Some studies seek to explain the reasons for the New Order's dramatic success of the Green Revolution in promoting rice production. The outstanding achievement has been linked to the long-term development strategy of adopting superior rice variety, increased agricultural input subsidies, irrigation rehabilitation, and agricultural extension services (Gabel and Springer 2019) ^[11] (Hill, 1988) ^[13]. Many studies have focused on the national aspects of the Green Revolution and the lack of regional pictures of the program. Given that Indonesia covers an extensive area with highly local ecological characteristics, it is essential to look at the implementation of the green revolution from a local perspective to understand the program better.

This study discusses the implementation of the green revolution in an area called the formerly Kepanjen District. The area is a lowland, where smallholder agriculture is dominant. For a long time, the local farmers employed traditional methods of cultivating rice with hereditary knowledge. They also planted local varieties of rice, especially Bengawan rice (Khudori, 2008:186) ^[15], and other varieties such as *Joko Bolot*, *Kuntul Nebak*, and *Manyar*. Manure and compost (Green fertilizers) have also been applied to improve soils. Under the Green Revolution, the traditional farmers were transformed into modern farmers, relying on chemical inputs, improved irrigation, and government-supported agricultural programs and institutions with the central goal of promoting rice productivity.

The objectives of the paper are: (1) to elaborate on the implementation of the Green Revolution policy in the Kepanjen District; (2) to examine how obstacles of Green Revolution implementation were overcome; and to investigate the impact of the Green Revolution policy on the socio-economic life of rural communities in the region. The spatial scope of this study is the Kepanjen District, Malang Regency of the East Java Province. The temporal scope is 1969-1998. The year 1969 is chosen as the starting year of implementing the Green Revolution policy based on Presidential Decree No.95 of 1969 on the Organization and Work Procedure of Bimas (mass guidance). The study ends in 1998 because this year marks the end of the New Order regime.

Materials and Methods

The research method used here is the historical method. It comprises five major stages: topic selection, source collection (heuristics), verification, interpretation, and historiography (Sasmita and Nawiyanto, 2012) [26]. The study was drawn upon both primary and secondary sources. Primary sources included statistical data from the Malang Regency and East Java Statistical Offices. Irrigation data were obtained from the Technical Unit Service of Water Resources in Ngajum and Kepanjen, Malang regency. The data were complementarily enriched by interviews conducted with historical witnesses and actors involved in implementing the green revolution in the area under consideration. Secondary sources included books and articles relevant to the discussed topic.

The Supporting Institutions

The Green Revolution implementation was supported by Bimas (mass guidance), PPLs (agricultural extension service personnel), and KUDs (Village cooperatives). Based on Presidential Decree No. 95 of 1969, the Bimas Control Board was formed at the level of the Ministry of Agriculture. The government formed the Bimas Supervisory Board at the lower levels, operating at the Provincial Level I and the Bimas Implementing Agency at the regency level. Bimas was implemented by the Minister of Agriculture, the Governor for Level I regions, and the Regent for Level II regions. The primary target of this program was farmers. The head of the agriculture office must cooperate with and be assisted by the head of the village community development, irrigation, and trade office. The officers who have been divided receive particular work instructions and guidelines in implementing a national program (Mubyarto, 1989: 52) [22].

The Region of Malang Level II, at the beginning of the implementation of Bimas, was led by the Regent. The Malang Regency Bimas Daily Implementation (PHBK) is divided into four groups, namely the Daily Implementation Leadership Assistance Group, the Expert / Technical Group, which is tasked with providing technical advice such as how to plant or how to deal with pests, the Bimas Extension which is tasked with providing information needed for the implementation of Bimas, the Bimas Supervisory Group. The Bimas Implementation Unit (*Satlak*) at the district level is led by the *Camat*, who is assisted by one Agricultural Mantri appointed as the Daily chairman of the *Satlak* under the supervision of the Malang District Agriculture Office. The *Camat* carries out the *monitoring* process through meetings by visiting villages under the sub-district, which

are scattered, especially in the former Kawedanan Kepanjen (Santoso, 1986: 86) [25].

Agricultural Extension Workers were tasked as educators who could increase knowledge, provide information to farmers, encourage farmers to work effectively and develop an attitude of openness and work in improving the welfare of farmers and their families (Bahua, 2016: 37). New Order, and agricultural extension was involved in guiding farmers in the implementation of Panca Usaha Tani. Before 1986, the Green Revolution policy used a centralized (top-down) and polyvalent pattern (plural competencies), while 1986-1991 became monovalent which only focused on specific subsectors (Harijati, 2014: 22) [12].

The implementation of counseling in Malang Regency is divided based on the former sub-district area, which is as many as eight regions, one of which is the Working Area of the Kepanjen Agricultural Extension Center (WKBPP). WKBPP Kepanjen consists of seven Agricultural Extension Work Areas (WKPP), namely WKPP Kepanjen, WKPP Pakisaji, WKPP Wagir, WKPP Sumberpucung, WKPP Kromengan, WKPP Ngajum and WKPP Wonosari (Interview with Agus Wahyudi, Malang, 15 July 2022). In one WKPP, 5-6 PPLs are responsible for 3-4 villages per person, two Intermediate Agricultural Extension Workers (PPM) and one Mantri Tani. Each WKPP usually has 16 farmer groups, with 3,600 and 6,400 farmers (Santoso, 1986:107) [25]. The Ngajum sub-district has 5 PPLs, each responsible for three villages (Interview with Pi'i, Malang, 14 July 2022).

In practice, PPLs and Mantri Pertanian are assisted by village agriculturalists, village heads, and other officials in gathering the masses and conveying difficulties from farmers. Fieldwork practices are carried out by PPLs every weekday for five days, while evaluations are carried out on weekends. Usually, they conduct a *setonan* (Saturday meeting) attended by PPLs from all WKPP sub-districts at BPP Kepanjen (Interview with Agus Wahyudi, Malang, 15 July 2022). PPLs conducted meetings with Farmer Groups to discuss the materials given by agricultural extension workers. The time of the PPL's visit, which is conducted five days a week, was utilized to deliver materials and practices (Interview with Madasim, Malang, 18 July 2022).

At the beginning of the New Order government, the initial concept of credit was established through Presidential Instruction No.4 of 1973, namely with the existence of BUUD (Village's Venture Unit) as the forerunner of the formation of KUD (Village Cooperatives). In 1973, BUUD Pakisaji, Kepanjen, and Sumberpucung were established, while BUUD Pakisaji and Wagir were established in 1974. In line with the issuance of Presidential Instruction No.2 of 1978, which contained BUUD/KUD, the previous Presidential Instruction was replaced and did not apply. BUUD developed into a cooperative business that belongs to the village community, namely KUD.

Following the function of KUD in general, the Kepanjen Cooperatives played a significant role in the implementation of agricultural development by providing services in the form of supply and distribution of production facilities and daily basic needs, processing and marketing of production products, serving credit and other activities required by members (Presidential Instruction No.4 Year 1984) [24]. The KUD of Kepanjen had several sectors handled by its branches, KUD Ngajum focusing on the food sector, farm sugarcane (*Tebu Rakyat Indonesia*), Credit Candak Kulak

(KCK), Bimas/ Supra Insus, Saprodi and Rural Cooperative Credit Service Center (PPKKP) (KUD Ngajum, 1990:13)^[18]. The KUD of Sumberpucung handled the credit sector, supply and distribution of production facilities, management of products, and marketing of the Rice Milling Unit (RMU), services, and industry (KUD Sumberpucung, 1999: 1-2)^[19]. KUD Kepanjen had a credit unit, food procurement, milling, agricultural production facilities (Saprotan), savings and loans, transportation units, and TRI (KUD Kepanjen, 1989: 12)^[17].

The Implementation of the Green Revolution

At the beginning of Repelita I, Malang Regency was led by the Regent Colonel Inf. H. R. Sowignjo, who ruled from 1 November 1969 to 1979, pioneered the beginning of agricultural development in Malang Regency. The Regional Level II Malang Regency began implementing the Green Revolution at the beginning of the New Order government, implemented by the *Bimas Gotong Royong Program (Bimas GR)* in 1968/1969 and Mass Intensification (Inmas) in 1968. The realization of the Green Revolution rice policy was carried out in stages so that it was evenly distributed in the Malang Regency area in the 1970s (Santoso, 1986: 32)^[25].

At the beginning of implementing the Bimas GR program, not all farmers were aware, and some others gave a wry and fearful response. This fear was based on farmers' past trauma (before the New Order) (Interview with Subagyo, Malang, 7 July 2022). Coercion is given to farmers by the sub-district Bimas Unit. Farmer Yateno revealed that the coercion given by the authorities was not in the form of violence, while the form of rejection by farmers was by not planting the seeds that had been distributed, namely PB-5/PB-8. In the end, they only used fertilizer on the local seeds they used so that the rice became fertile and collapsed (Interview with Yateno, Malang, 13 July 2022).

The Panca Usaha Tani program is an intensification program organized to mobilize farmers. The program consisted of five methods in accordance with the meaning of the word "Panca," namely the use of superior seeds, chemical fertilizers, and pesticides, improved planting methods, adequate and controlled irrigation, and more vital cooperatives (Santoso, 1986:35)^[25]. Farmers remember it as Garabah, which means "Garapan, Air, Rabuk, Bibit, Hama." The first seed varieties to be disseminated and planted were PB-5/PB-8 by farmers in the Ngajum sub-district (Interview with Wuliyani, Malang, 8 July 2022). In addition to the Ngajum area, the seedlings were received by farmers in the former Kepanjen sub-district, along with Urea fertilizer and pesticides. The PB-5 and PB-8 seeds are well known for their abundant yields. However, the taste is not good, and the texture is hard (Interview with Yateno, Malang, 13 July 2022).

Based on the Presidential Decree of the Republic of Indonesia No.3 of 1969, the government has guaranteed the availability of fertilizers and pesticides to complement agricultural production facilities. Since the 1970s, East Java farmers have used chemical fertilizers evenly. The initial fertilizer used was Urea, including in Malang District. The distribution of fertilizers to farmers from the government at the beginning of Repelita I was carried out in the village with data collection from Kuwowo to village officials. The head of the Sumber Makmur II Farmer Group, Yateno, was involved in fertilizer distribution at the beginning of the implementation of Bimas in 1969 before the KUD

(Interview with Yateno, Malang, 13 July 2022). Until the end of the New Order government, fertilizers distributed in the Kepanjen former Kawedanan area included Urea, ZA, Pusri, and TSP (Interview with Dja'i, Malang, 14 June 2022).

Farmers intensively plant new seedlings in line with the incessant counseling conducted from the village, sub-district, district, and regency levels (Interview with Yateno, Malang, 13 July 2022). PPL supervises land preparation by giving directions to use *kerek* (long bamboo sticks) to make it easier to equalize the size of the tiles with a length of approximately 25-30 cm per plot. (Interview with Widodo, Malang, July 15, 2022).

Since the start of the enhanced Bimas in 1970/1971, credit has been channeled through BRI Unit Desa. Credit was distributed to farmers for a period of one season (7 months) with 1% interest, then changed to two times with the two-season cycle system where farmers were given loans in a period of two seasons, namely the rainy season and the dry season (Birowo, 1981: 9). After the issuance of Presidential Instruction No. 2 of 1978, Bimas loans were no longer distributed by BRI Unit Desa. However, they became the authority of KUD in their respective areas. The credit was not imposed on all farmers and was used as a stimulus so farmers' capital was not constrained. It was expected that farmers would deposit their harvest (grain/paddy) with the KUD as a way of repaying the loan (Interview with Subagyo, Malang, 7 July 2022). In contrast to the Inmas Program, farmers use their capital (subsistence) to be more independent. The Inmas Program was implemented with limited funds and no credit, so there was no assistance from KUD (Wahyuni and Indraningsih, 2003:145)^[32].

Rice crops are very vulnerable to rat infestation, as in 1973/1974, there was a rat infestation in District Sumberpucung and its surroundings, so local farmers carried out grobokan. Furious farmers not only destroyed the rats but cooked and ate them (Interview with Widodo, Malang 15 July 2022). In addition, the 1975-1976 brown planthopper attack was inevitably the most severe that hit most farms in East Java, including the Malang region. The brown planthopper, which has the Latin *nilaparvata lugens*, attacked several sub-districts, including Kepanjen, Sumberpucung, Pakisaji, Ngajum and surrounding areas. The leafhopper attack shocked the lower and upper classes of society, including the Regent of Malang, R. Suwignyo, who instructed the prevention of the pest attack by spraying when there were positive signs of an attack (Kompas, 1 October 1976)^[16]. Special treatment was given to leafhoppers and grasshoppers with integrated treatment. The government made a policy to replace varieties with Planthopper Resistant Superior Varieties (VUTW), eradicate pesticides from the ground and air, and improve cropping and sanitation use (Birowo, 1981:8)^[3].

Serious leafhopper problems are handled by spraying thiodan drugs by land and air with helicopters on large land areas such as in Sumberpucung and surrounding areas (Interview with Yateno, Malang, 13 July 2022). These drugs can damage other organisms, so the handling of pesticide use for rice was stopped based on Presidential Instruction No.3 of 1986. In 1987, leafhopper attacks in the Ngajum area in Maguan and Banjarsari villages and the Kepanjen area were treated with a drug called applaud (Interview with Suhardi, Malang, 14 July 2022). After the leafhopper attack, farmers were encouraged to use VUTW seeds, including IR-

26, IR-30, IR-34, IR-36, and IR-60, because PB-5/PB-8 was considered less resistant to leafhoppers. PPL Tresno explained that the seed that is the mainstay of the former Kawedanan Kepanjen area, especially in the Kepanjen sub-district, is IR-64, which is considered the most consistent and tolerant to leafhoppers (Interview with Tresno Pamudji, Malang, 21 October 2022).

Implementing the intensification program in the form of Bimas/Inmas in the former Kawedanan Kepanjen area is divided into two parts, namely General Intensification (Inmum) and Special Intensification (Insus). The Insus program means planting Bimas/Inmas intensification rice in groups and the same field using VUTW seeds and using a minimum of 30% of the recommended fertilizer. The Inmum Program means the implementation of Bimas/Inmas, which implements Panca Usaha Tani in groups and in the same area or independently (BPS Malang, 1986: 86) ^[5].

The area planted under the Bimas Program in the former Kawedanan Kepanjen area decreased in 1984 when only 90 ha were planted with a yield of 566 tons. This decline was offset by an increase in the planting area of the Inmas Program, which was 17,878 ha with a yield of 103,947 tons. The decline in the participation of the Bimas Program in increasing rice production for the Malang Regency area began in 1976. The reasons were the implementation of Special Intensification (Insus), problems with the credit system, and the late delivery of production facilities, especially fertilizers (Santoso, 1986: 121) ^[25]. Insus was implemented in the 1976 planting season in several areas in East Java, such as Malang and Banyuwangi. The Bimas Control Board selected these two districts based on the criteria of above-average planted area and production (Situmorang *et al.*, 21) ^[29]. The government has issued Presidential Instruction No. 3 of 1986 on implementing Supra Insus to improve the program up to post-harvest handling by conducting ten agricultural measures (Department of Agriculture, 2005:90) ^[8].

The implementation of the Insus Program with the largest planting area in 1986 was District Sumberpucung, with an area of 5,147 ha, and the lowest was District Pakisaji in 1998, with an area of 350 ha, while the most extensive Supra Insus Program was District Kepanjen in 1992 with 3,348 ha. The lowest was District Wagir, with an area of 94 ha in 1998. The application of the Supra Insus Program in terms of harvest area is the most extensive in Kepanjen with 15,367 ha, Sumberpucung with 9,241 ha, Pakisaji with 6,722 ha, Ngajum with 4,699 ha, Kromengan with 3,333 ha, Wonosari with 1,114 ha and the lowest in Wagir with 975 ha. Wagir Sub-district is not a high Supra Insus enthusiast, but every year, it is still involved in the intensification program by implementing the Insus and Inmum Programs (BPS Kabupaten Malang 1986) ^[5].

At the end of the New Order regime, another food crisis occurred following the El Nino heatwave, resulting in large-scale crop failures. The end of 1998 saw the end of the Green Revolution policy, which was replaced by the Gema Palagung "Independent Movement for Rice, Soybean and Corn" to support food self-sufficiency in rice, corn, and soybean by 2001 (Department of Agriculture, 2005:121) ^[8]. In the first year of 1998, the former Kawedanan Kepanjen region experienced an increase in maize production and a decrease in soybean production. Maize production increased in 1998 to 25,410 tons, with the highest production in Sub-District Wagir at 10,666 tons. This increase suppressed

soybean production, with only 3 tons produced by Sub-District Pakisaji (BPS Malang, 1999: 86-88) ^[7]. The scarcity of soybean commodities threatens food availability in Indonesia, which is not the largest producer of soybeans. In addition to being constrained by the climate, the handling of pests that attack the commodity is still considered difficult for farmers (Arifin, 2004: 52) ^[1].

Challenges and Obstacles

Challenges and obstacles during the implementation of the Green Revolution policy in the former Kawedanan Kepanjen area include land shrinkage. Paddy fields are an important component in the production process, so the shrinkage that occurs provides an obstacle to increasing food productivity in the region. Land shrinkage seriously threatens production factors, especially in increasing food production when self-sufficient in rice. One of the land shifts was caused by the construction of the Karangates Dam, which led to the relocation of settlements. Population mobilization was carried out, especially in the Karangates Village area to Bandung Hamlet, near the Malang-Blitar highway. The housing provided for project compensation mainly was rice fields (Nawiyanto, 2022: 114) ^[34].

This development involved the relocation of the railroad that was submerged by the dam water from the Malang- Blitar line along 4 km. The construction of the Karangates Dam changed most of the watershed area in the form of rice fields, gardens, yards, and settlements inundated and became a reservoir. The inundation that occurred covered two sub-districts in the former Kawedanan Kepanjen, namely Kepanjen Sub-district with an area of 185,116 m² and villages in Sumberpucung Sub-district, which is still in the same area as Kromengan, with an area of 8,975,644 m². This inundation led to Karangates Baru Village, inhabited by 85 households on 200 m² of land with public facilities such as a mosque, market, and sports field (Nawiyanto, 2022: 113-115) ^[34].

From 1981 to 1998, the use of rice fields decreased. There was a reduction in the rice field area of around 1,900 ha from 1981 to 1983 and 1,800 ha from 1983 to 1986 until the end of 1998, only 11,606 ha. One of the causes was the increase in population during 1981-1986, from 363,757 people to 378,323 people. The increase in population occurred until 1997, with a population of 399,153 people (BPS Malang, 1998: 45) ^[7]. The relocation of the dam construction and the increase in population align with the reduction of land for the construction of housing, schools, markets, mosques, health services, and other facilities.

Second, there are obstacles to agricultural extension. Obstacles come from various parties, one of which is from farmers who are reluctant to accept reforms that are feared to reap losses. Farmers' relatively low knowledge influences the technology adoption process, as conveyed by farmer Samniti:

"In the past, my uncle also farmed, when distributing fertilizer, the car broke down in front of my father's house, and then the fertilizer was left behind. The fertilizer that was scattered, my father tried to use it on chili plants, but the chili died because he did not know the theory".

The use of chemical fertilizers is relatively new to Samniti. Farming practices passed down from generation to generation make it difficult for most farmers to accept new knowledge. Therefore, at the beginning of the implementation of the Green Revolution, not a few farmers

chose to refuse. The extension was hampered because the number of PPLs and transportation was limited to a large working area, so they were assisted by farmer contacts and delivered to farmer groups. The limited transportation means made the distance to the location longer, especially in areas on the slopes of Mount Kawi, such as Wagir, Ngajum, Wonosari, and Kromengan sub-districts (Interview with Agus Wahyudi, Malang, 15 July 2022). With these constraints, the method used by PPLs to gather the masses and increase production in the Kepanjen former Kawedanan area. Meetings were held in the fields with the establishment of Demonstration Plots (Demplot) in each WKPP as a place for demonstrations of planting seeds or practicing the use of seeds. Demplot successfully switched to Demonstration Farming (Demfarm) and developed more widely into a Demonstration Area (Demarea) (Interview with Tresno Pamudji, Malang, 21 October 2022). Agricultural counseling, which was initially located at BPP starting in 1985, changed to be distributed to the respective offices in 1992 (Setiawan, 2005: 59) ^[28].

Third, Bimas' credits are problematic. KUD is prominent in providing farm business credit, such as production facilities and business funds. In the management of KUD, an area is supervised by the sub-district head, who is under the guidance of the local district Cooperative Office. Management issues formed in a cooperative are elected through the annual meeting. The statement states that cooperatives or cooperatives should be open, and the welfare of members is a top priority (Dick, Fox and Mackie, 1997: 308) ^[9]. However, some misappropriation occurs in cooperatives in the former Kawedanan Kepanjen, as in KUD Sumberpucung II, Pakisaji, and Kepanjen. Most credit problems stem from the failure of production and misuse of the credit recipient.

Some KUD former Kawedanan Kepanjen area has been led by the local elite of the village and sub-district, and the majority of the board comes from party members and the Association of Retired ABRI (Pepabri). Since its establishment, groups have dominated cases in KUD Kepanjen, KUD Pakisaji, and KUD Sumberpucung II so that the operation could be running better in the management and the main task of KUD. As an example of the case in KUD Sumberpucung II, with the domination by the chairman of the cooperative and his friends until 1983 proved to be corruption, then the Regent of Malang Regency, ordered Wedana former Kawedanan Kepanjen namely Sanoto to take over the management of the cooperative by forming new officials mainly consisting of local government Sumberpucung under his leadership to solve the internal problems of the cooperative (Santoso, 1986: 197-199) ^[25]. In addition to corruption, Bimas loans were problematic because of crop failures due to the 1976-1977 leafhopper infestation that left farmers unable to repay their debts. The government breached the loans, but some cooperatives denied the bleaching by forcing payments due to weak credit administration in the cooperatives (Dick, Fox, and Mackie, 1997: 307) ^[9].

The Impact of the Green Revolution

Implementing the Green Revolution has changed the community's survival, especially for farmers in the former Kawedanan Kepanjen area. First, the change from traditional to modern agriculture. Modern agricultural technology packages have been implemented since the

beginning of the Bimas/Inmas Program with the practice of Panca Usaha Tani. The package consists of chemical fertilizers, superior rice seeds, and pesticides. The introduction of superior seeds of High Yielding Varieties (HYV), namely PB-5/PB-8, began changing traditional habits. Land cultivation began using tractors subsidized by the government to farmer groups in Sumberpucung in 1970/1971 (Interview with Samniti, Malang, 14 June 2022). The use of tractors was still limited to areas with steep terrain, such as Ngajum, Wonosari, and Wagir. Tractorization was evenly distributed to the Kepanjen district in 1984/1985 (Interview with Dja'i, Malang, 14 June 2022). The first use of chemical fertilizers such as Urea, ZA, TSP, and KCl until Liquid Complementary Fertilizers (PPC) and Growth Regulators (ZPT) were applied by hand sprayer. The harvest of rice grains became voluminous, so harvesting switched to using a sickle to reach more rice and threshed using a thresher machine. Government subsidies to cooperatives for other farmer needs, such as the construction of warehouses, Rice Miling Units (RMU), and other agricultural equipment (Interview with Subagyo, Malang, 7 July 2022).

Second, patron-client relations in the farming community are mutually beneficial with mutual give and take. Farmers as patrons and farm laborers as clients. Since the Green Revolution policy, the relationship between the two has faded. A new patron-client system has emerged between the government and farmers. Most farmers have become dependent on the government through institutions established for the success of rice self-sufficiency, especially KUD. Six cooperatives are scattered in the area of former Kawedanan Kepanjen as a provider of production facilities and credit to accommodate the harvest of farmers who deposited to Sub Dolog. Then Bulog, but not all farmers deposit their crops to KUD. Farmers prefer to sell their harvest to intermediaries with a slash system (Interview with Subagyo, Malang, 7 July 2022).

The waning relationship between farmers created a new pattern of patron-client relationship between farmers and slaughterers with the tebasan system. This system became widespread in the 1980s, with almost 70% of farmers opting for tebasan because it was more accessible and practical (Interview with Tresno Pamudji, Malang, 21 October 2022). Experienced intermediaries/breeders have generally become permanent helpers of other companies, making them difficult to deal with. Farmers make sales to intermediaries with price in mind. Farmers prefer to receive money in advance before harvesting (KUD Sub-District Kepanjen, 1985:12). According to Yateno, farmers in the Sumberpucung area prefer to make transactions with slaughterers who have permanent staff rather than having to find their laborers, thus saving the labor of the farmers themselves (Interview with Yateno, Malang, 13 July 2022). Farmers are no longer patrons of their region and do not feel dependent on smallholders (farm laborers) because everything is under control by government institutions and the role of the private sector. This is one example of farmers' dependence on the government and the private sector, such as loggers, which has reduced the use of nderep and nutu female laborers.

Third, the improvement of farmers' welfare. The increase influenced the welfare of farmers in rice production as a result of agricultural intensification through the Bimas, Inmas, Insus, and Supra Insus Programs. The increase in

rice production in the former Kawedanan Kepanjen area was seen from the first six years (1970-1976), with the highest productivity being Sub-District Kepanjen with an average annual production of 25,000 tons, while Sub-District Sumberpucung had an average production of 23,000 tons

and for Sub-District Pakisaji the average production was 11,000 tons per year (Santoso, 1986:151) ^[25]. In addition to the application of Panca Usaha Tani, the increase in production in the region was affected by the construction of the Karangates Dam, which was inaugurated in 1972.

Table 1: Rice Productivity in the Former Kawedanan Kepanjen Region in 1970-1986

Year	Kepanjen	Pakisaji	Sumber Pucung	Ngajum	Wagir	Total
1970	19.919	9.604	20.704	-	-	50.227
1971	22.544	11.156	20.444	-	-	54.144
1972	23.806	9.845	21.648	-	-	55.299
1973	26.095	12.087	23.633	-	-	61.815
1974	29.113	13.688	25.026	-	-	67.827
1975	32.691	12.968	27.539	-	-	73.198
1976	29.038	8.196	31.828	20.398	10.818	100.276
1977	23.211	11.253	30.347	15.839	7.157	87.807
1978	25.758	10.940	25.828	17.307	8.650	88.483
1979	28.121	11.819	29.496	18.686	8.236	96.358
1980	27.949	13.377	29.714	19.934	10.059	101.033
1981	30.165	16.804	41.016	18.100	10.195	116.280
1982	27.275	15.452	27.505	11.810	8.915	90.957
1983	28.583	14.478	34.080	22.370	9.363	108.874
1984	27.760	15.995	32.623	19.811	8.631	104.820
1985	27.432	13.950	35.325	24.247	8.699	109.653
1986	27.664	15.982	39.135	21.222	9.590	113.593
Total	457.124	217.594	495.891	209.724	100.313	1.480.644

Source: Badan Pusat Statistik, Kabupaten Malang Dalam Angka Tahun, 1980, 1981, 1982, 1983, 1984, 1985, 1986.

The table shows that rice production fluctuated until 1986. The region consistently achieved an increase in production to 100,000 tons until the highest achievement in 1986, 113,593 tons. The order of rice productivity in the former Kawedanan Kepanjen area from 1970-1986 from the highest is Sub-District Sumberpucung with a production of 495.891 tons with an average annual production of 29.170 tons, Kepanjen with a production of 457.124 tons with an average annual production of 26.889 tons, Pakisaji as much as 217.594 tons with an annual production of 12.799 tons. The Ngajum region produced 209,724 tons of rice in 1976-1986, with an annual average of 19.065 tons, and Wagir produced 100.313 tons, with an annual average of 9.119 tons.

Production increased during this period, and in addition to the support of the Green Revolution program, there was adequate irrigation support. The Karangates (Sutami) Dam, which was inaugurated in 1972, positively impacted the increase in rice production in the region. Planthopper attacks that hit the region resulted in a decline in rice production in 1976. The decline in production was seen in Kecamatan Kepanjen and Pakisaji. In contrast, Kecamatan Sumberpucung did not see a decline in rice paddies due to the Bimas planting area increasing by 21% from 1973-1976, with yields from 4.5 to 4.9 tons (Amir Santoso, 1986:159). A decline in rice production was seen until 1979 when leafhoppers, rats, and walangsangit attacked areas such as Pakisaji. The increase in production in 1980 has been supported by a change in the use of seeds by farmers, with as much as 95% using IR-34, IR-36, and IR-38 seeds. Tresno Pamudji also explained a change in seed varieties planted by farmers in Kepanjen and surrounding areas (Interview with Tresno Pamudji, Malang, 21 October 2022). This proves that the achievement of rice self-sufficiency was in line with the increase in rice production in the former Kawedanan Kepanjen area, especially with the Insus Program. Agricultural development was not only supported by technological engineering but also developed into social

and economic engineering through the Supra Insus Program. After the expansion in 1993-1998, the order of areas that had the highest rice production as rice granaries in the Ex Kawedanan Kepanjen area was Sub-District Kepanjen with a yield of 129,740 tons, Sub-District Kromengan with 94,897 tons, Sub-District Sumberpucung with 85,072 tons, Sub-District Pakisaji with 74,496 tons, Sub-District Ngajum with 52,826 tons, Sub-District Wagir with 36,922 tons and finally Sub-District Wonosari with a yield of 35,560 tons (BPS Kabupaten Malang, 1993-1998).

In one planting time at the beginning of the PB-5/PB-8 seed harvest, they yielded 8 tons/ha and even reached 15 tons per ha. Although they experience ups and downs every period, they try to maintain a yield of 6-7 tons/ha (Interview with Agus Wahyudi, Malang, 15 July 2022). They use the harvest every season to fulfill their daily needs. Subsistence farmers store their crops in *lumbung* (rice barns) to provide food while waiting for the next harvest (approximately six months). At the same time, the rest was used to buy *rojokoyo* (livestock) (Interview with Widodo, Malang, 15 July 2022). The rice granary is decreasing with agribusiness marketing in the Supra Insus post-harvest handling, which is relatively easy so that farmers no longer store their crops. This is done by farmers who have one hectare or more of land. They prefer to sell rice to intermediaries or cooperatives. Samniti explained that as a farming family, the increased yields could be used to pay for the schooling of her four children up to senior high school level at that time (Interview with Samniti, Malang, 14 June 2022). In addition, the fulfillment of basic food needs no longer relied on cassava processed into cassava and tiwul as in the previous period. The improvement in the agricultural economy had a broad impact on other fields so that most farmers enjoyed a more prosperous life than in the previous period (Interview with Yateno, Malang, 13 July 2022).

Conclusions

The food crisis in the 1960s was the initial impetus for implementing the Green Revolution in Indonesia. The program was supported by institutions operating from the national to regional levels. They guided and supported the farmers in executing the Green Revolution program launched by the New Order government. There were obstacles that needed to be overcome to reach the target of promoting rice production. Government institutions such as Bimas KUD and the role of PPL in conducting agricultural extension facilitated the program's implementation. Agricultural innovations ranging from seeds, fertilizers, and irrigation to machine-based equipment have reduced the farmers' dependence on nature and began to hold a more considerable control of rice production. In promoting rice production, the farmers had to fight against the attacks of pests and diseases that sometimes caused big harvest losses in particular years. Despite the problems that needed to be overcome, there was a trend of rice production until the achievement of rice self-sufficiency. The increase was due to the success of the Insus Program. Kepanjen was a district enjoying a rising trend of rice production stemming from a significant increase in rice productivity. As rice production grew, the farmers experienced a growing income and better material living standards.

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