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Agricultural modernization as a prime mover of social change in farming communities

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ABSTRACT

The modernization of agriculture (Green Revolution) has produced significant social impacts on rural farming communities, influencing class structure, gender roles, and community organization. This study aims to: (1) identify the characteristics and social structure of rural farmers, (2) examine the factors driving social change, and (3) explore the social issues arising within farming communities. Using a mixed-methods approach, qualitative data were collected from 15 purposively selected informants, and quantitative data were gathered from 90 randomly chosen rice farmers. The findings show four main farmer groups: large farmers with extensive land, medium farmers with adequate land, small farmers with limited land, and landless laborers. Key drivers of social change include demographic shifts, urbanization, changing social stratification, social movements, and technological developments. In South Sulawesi, especially in Sidrap Regency, changes in land ownership, population growth, the adoption of modern inputs, and mechanization have intensified social polarization and stratification. These changes often marginalize small farmers, highlighting the need for government policies that expand agricultural employment opportunities and strengthen rural production institutions.

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1. Introduction

Changes in economic policy that become central to social transformation are a long-standing phenomenon in Indonesia, particularly in rural areas of Java. Many forms of change have occurred, but two major processes, industrial capitalism and revolution, have received significant attention in studies of Third World countries as key explanations of these transformations. These processes arise from both endogenous and exogenous factors. Endogenous factors include increasing pressure on land due to population growth, the emergence of wage labor, and demographic expansion. Exogenous factors include the commercialization and monetization of agriculture through capitalist expansion, the diffusion of technology, improved accessibility, and the development of communication networks (Faoziyah et al., 2024). Modernized agriculture has reduced the space and opportunities for small-scale farming. It requires the use of modern inputs, which small farmers often lack the financial capacity to afford. As a result, many small farmers are unable to continue agricultural production because the costs of production are too high (Manono, 2025).

Agricultural development policies introduced by the New Order government through the Green Revolution program in the 1970s led to significant changes in the agricultural system. These policies transformed traditional institutions and created barriers to entry for poor farmers and agricultural laborers within the agricultural production system. As a result, small-income farmers and laborers became increasingly marginalized, while wealthier farmers expanded their economic position, leading to greater social inequality in rural areas.

This inequality emerged because farmers with larger landholdings were more open to adopting new technologies, which allowed them to become commercial farmers. In doing so, they often neglected traditional obligations and social ties with poorer farmers. Agricultural modernization, through the large-scale introduction of fertilizers, pesticides, improved seeds, intensive land use, and mechanization, did not significantly improve the welfare of farmers with limited land. Their access to technology remained more restricted than that of

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farmers with larger farms, and their overall economic conditions showed little improvement.

In some cases, technology was viewed by farmers not only as a means to increase production but also as a symbol of social status. Consequently, rural farming communities became divided into two groups: commercial farmers and agricultural laborers (White et al., 2023).

This study examines changes in farmers' social conditions from multiple perspectives, with agricultural modernization theory serving as the main framework for explaining social change in rural communities. According to Wu and Li (2024), the penetration of capitalist economic forces, originating from urban areas and rural regional development programs, has had a strong influence on rural life and social organization. Under these conditions, rural communities in general, and farmers in particular, are compelled to respond to external pressures in order to sustain their livelihoods. As a result, adaptation becomes unavoidable.

This study investigates the extent to which agricultural modernization acts as a key driver of change in rural society and whether it leads to social polarization or intensified social stratification. The research adopts a modernization theory approach and employs both qualitative and quantitative methods. The qualitative approach aims to provide a comprehensive and in-depth understanding of the social phenomena under investigation. The quantitative approach is used to analyze changes in land ownership and occupational patterns among respondents using time-series data. The research strategy combines case studies and survey methods.

2. Theoretical framework

2.1. Agricultural modernization and social change

Theories of social change, modernization, and development are largely grounded in capitalism. Adam Smith's theory of the division of labor emphasizes the role of capital accumulation in economic development (Cai et al., 2022). In contrast, Karl Marx viewed this process as exploitative, arguing that it involves the appropriation of surplus value that should belong to workers.

Another important contribution to modernization and development theory comes from Auguste Comte's evolutionary theory (Cai et al., 2022). This theory suggests that societies develop gradually from simple (primitive) forms to more complex (modern) ones through a long, stage-by-stage process. Comte emphasized the role of human intervention in guiding these stages of development. This idea later supported the concept of planned modernization, often referred to as social engineering, which Herbert Spencer associated with social Darwinism. Such perspectives have strongly influenced modern approaches to development and globalization, often viewing tradition and culture as obstacles to progress.

In addition to these perspectives, functionalism provides another important theoretical framework. Classical functionalist theorists, particularly Parsons and Merton, viewed society as a system of interconnected and interdependent parts. Changes in one part of the system produce changes in others, ultimately leading toward social equilibrium (Parsons, 1951; Merton, 1968). From this perspective, social change is seen as gradual and orderly, while social conflict is interpreted as a sign of dysfunction in social integration and stability.

However, functionalism has been widely criticized for ignoring unequal distributions of power and resources. Critics argue that this approach often conceals how social structures benefit certain groups while marginalizing others, thereby downplaying or legitimizing exploitation, oppression, and discrimination.

Contemporary rural communities are commonly stratified by income, status, and power, largely determined by ownership and access to productive assets. This stratification is reflected in the distribution of jobs and social positions. At the local level, informal horizontal solidarity networks, based on kinship and neighborly relations, provide mutual support and help households maintain subsistence livelihoods. At the same time, these horizontal relations are intersected by vertical networks based on kinship, ethnicity, caste, and patron–client relationships.

From a Marxist perspective, class structure is defined by relationships to the means of production. Society is divided into groups based on ownership and control of production, resulting in distinctions between exploiting and exploited classes.

Cai et al. (2022), drawing on evolutionary theory, argued that social change is generally unidirectional, linear, gradual, and progressive. This process moves societies from primitive to more advanced stages and leads to similarities in social forms and structures across different societies. From a modernization perspective, this framework highlights several key characteristics: (1) modernization is gradual, (2) it promotes homogenization, (3) it is viewed as irreversible, (4) it requires a long time, (5) it is systemic, and (6) it involves structural transformation.

Finally, Wahyono et al. (2023) noted that modernization is also reflected in the expansion and increasing complexity of state bureaucracies, along with the rationalization of their organizational structures. This process is part of broader social differentiation, which results in more specialized institutions and functions. Social differentiation is closely linked to the growing division of labor and specialization, a trend that is clearly observable within modern organizations.

2.2. Marginalization of small farmers

The concept of marginalization provides an important framework for understanding processes

of social and economic transformation. Marginalization is not a natural condition but a relational and socially constructed process (Aji, 2021). It involves the simplification, stereotyping, comparison, and ranking of social groups based on predetermined criteria, which ultimately shapes access to resources and opportunities.

According to Cai et al. (2022), agricultural development policies introduced by the New Order government through the Green Revolution in the 1970s transformed traditional institutional systems and restricted the participation of poor farmers and agricultural laborers in the agricultural production system. Farmers with larger landholdings gained greater socioeconomic access, enabling more intensive use of agricultural technology, while smallholder farmers faced structural disadvantages.

However, this view has been challenged by other studies. Ruswinarsih et al. (2024) argue that the distribution of agricultural technology in rural areas tends to be scale-neutral, meaning it can be used by both large- and small-scale farmers. Supporting this argument, Handayani et al. (2023) found that smallholder farmers often use more fertilizer than larger farmers. This behavior reflects a subsistence-oriented economic logic, in which small farmers adopt available technologies as long as they help maintain household economic security. In some cases, smallholders are also more compliant than large farmers in following government recommendations on agricultural practices.

The claim that technological diffusion increases social inequality (Cai et al., 2022) is further debated by Ruswinarsih et al. (2024), who suggested that technological adoption in rural Java has reduced polarization while increasing social stratification along a continuum. Strong rural social institutions can limit polarization by maintaining social cohesion (Budiandrian et al., 2022). Polarization tends to intensify only when opportunities for income diversification or employment outside agriculture become increasingly restricted for poorer groups. Even unequal land ownership does not necessarily lead to open class conflict if alternative livelihood opportunities remain available (Clarisa and Sukayat, 2024).

Despite relatively high levels of technological access, Cai et al. (2022) argued that modernization-based agricultural policies, such as the large-scale use of fertilizers, pesticides, improved seeds, and intensive land cultivation, have not significantly improved the welfare of farmers with limited land. Their economic position often remains unchanged, and in some cases, agricultural technology is perceived more as a symbol of social status than as a means of increasing productivity.

From an ecological and smallholder perspective, the Green Revolution is also criticized as an unsuitable strategy for sustainable food production. High-yield seed varieties primarily benefit agribusiness firms by creating new markets and displacing traditional farming practices that maintain soil fertility. Small farmers are often forced to purchase new seeds by linking access to credit, irrigation, and other inputs to the use of these varieties (Wu and Li, 2024).

Evidence of smallholder marginalization under the Green Revolution can be observed in several ways. First, many small farmers lack access to credit and agricultural equipment and are excluded from high-value crop production packages. As a result, they lose control over food production that previously supported household consumption. The impoverishment of rural communities and declining access to food resources have contributed to food surpluses at the macro level while increasing vulnerability at the household level (Dino et al., 2023).

As agricultural production becomes increasingly commodified, small farmers, who are unable to accumulate capital, turn to moral economy strategies based on kinship and social reciprocity. Although the commodification of agriculture is often seen as a threat to the moral economy, Wu and Li (2024) argue that when markets and moral economies coexist, these social strategies can reduce inter-class tensions and provide a form of subsistence security that limits social unrest.

Handayani et al. (2023) also identified a process of agricultural involution and shared poverty. Mechanization has reduced the demand for farm labor and eliminated traditional profit-sharing arrangements. For example, the introduction of mechanical harvesters has displaced manual labor, leading to rising unemployment in rural areas.

At the policy level, the government has imposed Green Revolution conditions that intensify class tensions within rural moral economies. At the same time, it has emphasized the preservation of tradition to prevent social unrest by masking the negative consequences of development policies. Farmers have been compelled to adopt high-yield varieties by linking them to access to credit, irrigation, and other inputs (Ruswinarsih et al., 2024).

Finally, Handayani et al. (2023) concluded that while the Green Revolution significantly increased crop yields, much of the economic benefit accrued to local traders and merchants. Small farmers became increasingly dependent on capital-intensive inputs such as tractors, fertilizers, mechanical threshers, and rice mills, which were accessible mainly through traders at high cost. For many smallholder households, farming alone could no longer sustain livelihoods, requiring at least one family member, typically an adult male, to seek additional income outside agriculture.

3. Methodology

This study employs a mixed-methods approach, combining qualitative and quantitative research methods. The qualitative component uses an intrinsic case study approach to gain an in-depth understanding of the research context. Qualitative research is a systematic procedure for producing descriptive data in the form of words, texts, and

observed behaviors (Bijanto et al., 2023). Case studies are particularly suitable for exploratory, descriptive, and explanatory research objectives.

The quantitative component adopts a survey approach to examine changes in land ownership and employment status before and after the Green Revolution policies. The study was conducted in Sereang Village, Maritengngae District, Sidrap Regency. This location was selected because it has experienced agricultural modernization for a long period and is recognized as a major food-producing area in South Sulawesi.

Informants for the qualitative study were selected using purposive sampling, as this technique allows the inclusion of participants who are most relevant to the research objectives. A total of 15 informants were interviewed, consisting of five community leaders and ten farmers from different social categories: three land-owning farmers, three tenant farmers, and four agricultural laborers.

For the quantitative survey, respondents were selected through random sampling. A total of 90 rice farmers were surveyed, representing 45% of the total population of 200 rice farmers in the village.

Qualitative data were collected through in-depth interviews, field observations, and document analysis. The interviews were guided by a semi-structured interview protocol containing core questions that were further developed in the field based on emerging findings. Field observations were conducted through direct observation of farmers' activities and land-use practices. Documentation involved collecting relevant information from various sources, including official documents and photographs related to research activities.

Quantitative data were collected through structured questionnaires, supported by field observations and documentation. The questionnaire included items related to land ownership, employment status, and other key variables examined in the study.

Data analysis followed the analytical framework proposed by Li et al. (2024a), which consists of three stages: data reduction, data display, and conclusion drawing and verification. The findings were interpreted using agricultural modernization theory and labor development perspectives.

4. Research results and discussion

4.1. Agricultural modernization

Agricultural modernization and the introduction of new technologies through the Green Revolution have had diverse impacts on farming communities. These impacts differ across social strata and gender groups and have ultimately reshaped the structure of rural society. According to Li et al. (2024a), the Green Revolution increased rural communities' dependence on wage income. Wealthier farmers tended to benefit more from technological change, and men generally gained greater advantages than women.

The Green Revolution and technological change increased men's social and economic benefits while reducing women's roles in agriculture. Women lost important social functions and became more marginalized in terms of participation and experience (Li et al., 2024b). In traditional agricultural systems, productivity differences between men and women were largely related to physical strength. As agriculture became less dependent on human labor and more reliant on technology, these differences might have been expected to decline. However, in practice, older men were more likely to adopt modern technologies and equipment, while women were increasingly confined to simple physical tasks in the fields (Ruswinarsih et al., 2024). As a result, male productivity increased, while female productivity remained relatively stagnant (Handayani et al., 2023).

Several studies on agricultural modernization in Indonesia, particularly those examining the Green Revolution, highlight its significant achievements. The program led to substantial increases in agricultural production, culminating in a national food surplus in 1984. South Sulawesi became one of Indonesia's major food-producing regions. Despite these achievements, the Green Revolution negatively affected small farmers by increasing dependency on external inputs and developed countries, while also disrupting established rural social structures.

Agricultural development during this period generated several key trends in rural areas. First, agricultural intensification became the primary strategy of the Green Revolution, with a strong emphasis on increasing production through the adoption of advanced technologies unfamiliar to traditional farmers. Second, agricultural development was closely linked to the assumption that farmers' welfare could only improve through increased production.

According to Li et al. (2024b), early agricultural development policies focused heavily on physical technologies, such as irrigation development, improved seed varieties, chemical fertilizers, pesticides, and intensive cultivation methods. These measures aimed to rapidly increase production and farmers' income while absorbing labor. In addition to physical technologies, social technologies, such as institutional and organizational support, were also developed to facilitate agricultural modernization.

Alongside advances in agricultural inputs, mechanized technologies such as tractors and harvesting equipment were introduced for land preparation, harvesting, and post-harvest processing. While mechanization reduced labor requirements and improved efficiency, it also replaced human labor, affecting both men and women. This created serious challenges in rural areas, particularly in the context of rapid population growth, limited employment opportunities, and shrinking agricultural land.

Over the past decade in South Sulawesi, particularly in Sidrap Regency, significant changes have occurred in agricultural labor relations. These

changes have been driven by several factors: (i) reduced land control by farmers due to land sales, inheritance, transfers, or rental arrangements, which affected labor demand for both men and women; (ii) rapid population growth, which increased the supply of agricultural labor; (iii) the adoption of modern agricultural inputs, which raised production but also increased the need for consistent labor to maintain input use; and (iv) the use of mechanized equipment that replaced human labor, especially female labor, creating new challenges both within and beyond the agricultural sector.

From a theoretical perspective, Wu and Li (2024) explained social change as a unidirectional, linear, gradual, and progressive process that moves societies from primitive stages to more advanced forms, resulting in increasingly similar social structures. This perspective forms the basis of modernization theory, which is characterized by several features: (i) modernization is gradual, (ii) it promotes homogenization, (iii) it is viewed as irreversible, (iv) it requires a long time, (v) it is systemic, and (vi) it represents a process of structural transformation.

According to Budiandrian et al. (2022), modernization is also reflected in the expansion and rationalization of state bureaucracies. This process is part of broader social differentiation, which leads to the emergence of increasingly specialized political institutions with specific functions. Structural differentiation occurs when social units that once performed multiple functions divide into specialized substructures. This transformation enables more efficient performance of social functions. Ruswinarsih et al. (2024) further argue that modernization involves both differentiation and reintegration processes. Together, these processes enhance societal adaptation to environmental change and increase the efficiency of increasingly complex social systems.

4.2. Prime mover in social change

This study examines social change in rural communities by drawing on classical and contemporary theories of social change. These theories help explain the underlying forces shaping transformations in rural farming societies. Wu and Li (2024), drawing on historical materialism, argue that human behavior is primarily shaped by material conditions rather than ideas. Ideas themselves are part of material reality. From this perspective, economic structures act as the main drivers of social change, as transformations in material conditions lead to broader social change. Social change becomes possible through conflicts of material interests, and social conflict is therefore closely linked to social transformation (Handayani et al., 2023).

Cai et al. (2022) emphasized that current development challenges are closely connected to past social changes. They identify five main driving forces of social change: (i) demographic processes, (ii) urbanization, (iii) changes in social stratification, (iv) social movements, and (v) industrialization and technological development. Each of these factors contributes to social change in rural farming communities. Among them, demographic change is considered the most influential, as population dynamics are often the first element to alter social structures. Cai et al. (2022) noted that changes in one social structure tend to trigger changes in others. A prime mover, therefore, refers to the most influential factor initiating social change.

Aji (2021) argued that population growth can create dysfunctions in social structures, requiring societies to seek new forms of balance and adaptation. When populations are sparse and natural resources are abundant, livelihoods are relatively easy, reducing incentives for innovation and leading to social stability. In contrast, high population density and limited land often produce widespread poverty. However, poverty does not result from social stagnation; rather, poverty itself creates conditions that restrict innovation and risk-taking.

In relation to population structure, Geertz's theory of agricultural involution provides valuable insight into social change among farming communities, particularly in lowland rice-growing areas. Agricultural involution refers to intensification without the introduction of new economic organizations or technologies, instead relying on increasing labor input beyond its productive capacity (Budiandrian et al., 2022).

According to Dino et al. (2023), these social changes have produced new patterns of integration in agriculture, including the emergence of new labor relations and social institutions. Several key patterns can be identified: (i) farmers who previously controlled large areas of land have reduced their holdings or become agricultural laborers; (ii) small landholders face increasing pressure as agricultural output becomes insufficient to meet household needs, prompting livelihood diversification; (iii) land fragmentation and labor surplus encourage rural workers to seek employment outside agriculture, particularly as mechanization replaces human labor, especially female labor; and (iv) the introduction of new agricultural technologies creates new employment opportunities, while rapid population growth pushes less-skilled workers into low-income non-agricultural sectors.

A key issue is whether labor shifts away from agriculture are driven primarily by technological change or by population pressure. Agricultural laborers and marginal farmers have become the most vulnerable groups because they lack stable employment and cannot rely on consistent income. Ironically, many are absorbed into informal, low-productivity non-agricultural activities that offer little improvement in income or welfare.

The transition to non-agricultural employment cannot be explained solely as a direct effect of technological displacement. Rather, it reflects a combination of technological pressure and limited livelihood options. In extreme cases, the Green Revolution has indirectly pushed agricultural

laborers out of farming, even though they do not enter technology-intensive sectors.

According to Aji (2021), the introduction of new technologies in agriculture has contributed to the emergence of increasingly wealthy rural groups with greater control over productive resources. Technological diffusion can widen social gaps; however, when economic benefits are shared relatively evenly, rural societies may become more stratified rather than polarized. Strong village social institutions can prevent polarization, but polarization is more likely when opportunities for income diversification outside agriculture become increasingly limited for poorer households (Handayani et al., 2023). Unequal land ownership alone does not automatically lead to class conflict as long as alternative livelihood opportunities exist (Clarisa and Sukayat, 2024).

Finally, theories of social change in modernization and development are fundamentally rooted in capitalism. According to Dino et al. (2023), technological progress influences how goods and services are distributed in society, which in turn shapes social structure. In societies with simple technologies, distribution is largely based on need. In contrast, in technologically advanced societies, distribution increasingly reflects power relations.

Structural change in society can therefore be understood through changes in distribution systems. Social distribution systems consist of individuals, social classes, and class systems. Social classes refer to groups occupying similar positions in terms of power, privileges, and prestige. These classes are organized within broader class systems based on criteria such as ownership, occupation, and political influence.

4.3. Social change in the farming community

Social changes observed in the farming community of Sereang Village are closely linked to the implementation of agricultural modernization in paddy fields. These changes have occurred over a long period alongside the Green Revolution and are reflected primarily in processes of marginalization. The main indicators of this marginalization are changes in land ownership and employment status.

For small farmers in Sereang Village who own less than 0.5 hectares of land, the Green Revolution has largely been unprofitable. According to informants, landholdings have gradually decreased or disappeared as small farmers were forced to sell their land. This land loss is mainly attributed to rising production costs following the adoption of modern technologies and increasing dependence on industrial agricultural inputs. As a result, small farmers sold their land to larger farmers and shifted their employment status, becoming tenant farmers, agricultural laborers, harvest workers, migrant workers, or motorcycle taxi drivers.

In contrast, large farmers in Sereang Village have benefited from the Green Revolution. Supported by strong capital and broader external networks, they have been able to reinvest in rice farming and expand their landholdings by purchasing land from small farmers. This has reinforced inequalities in access to productive assets.

In addition to changes in land ownership, marginalization is also evident in shifts in employment status. Empirical data from Sereang Village show a decline in the proportion of landowning farmers and an increase in the number of agricultural laborers. Despite these changes, most informants remain engaged in paddy farming for several reasons: (1) rice farming provides a sense of economic security, (2) it is perceived as less risky than other occupations, and (3) alternative employment opportunities outside agriculture are limited.

Although small farmers recognize that the Green Revolution has primarily benefited large farmers, some informants acknowledged limited advantages, particularly increased access to wage labor opportunities on the land of larger farmers. Nevertheless, off-farm employment opportunities have not significantly improved the welfare of small farmers and mainly serve as survival strategies.

For women farmers in Sereang Village, the Green Revolution has had mixed effects. Some women perceived the Green Revolution as beneficial because the introduction of harvesting machines increased their participation in harvest and post-harvest activities. Three informant households reported positive outcomes due to their ability to adopt new technologies. However, one household viewed the Green Revolution as unprofitable, as it required the adoption of alternative survival strategies, such as opening a small shop while continuing domestic work.

Overall, these findings indicate significant social change in the farming community of Sereang Village as a consequence of agricultural modernization. Changes in land ownership and employment status have led to social polarization and intensified social stratification. Large farmers have gained greater access and opportunities to expand land ownership, while small farmers have experienced declining access and reduced opportunities due to land sales. This process has widened the gap between large and small farmers, highlighting the unequal outcomes of agricultural modernization.

Changes in land ownership and employment status in Sereang Village are presented in Tables 1 and 2.

Based on the empirical data, land ownership patterns in Sereang Village changed significantly following the Green Revolution. The proportion of respondents owning less than 0.5 hectares of land increased from 33.33% before the Green Revolution to 66.66% after its implementation. In contrast, the percentage of respondents owning between 0.5 and 1 hectare declined from 50.00% to 23.33%. Similarly, landholdings larger than 1 hectare decreased from 16.66% before the Green Revolution to 10.00% afterward. In Sereang Village, the occupational structure of respondents changed

markedly following the Green Revolution. Before its implementation, 56.67% of respondents were owner-farmers, while 26.66% were agricultural laborers. After the Green Revolution, the proportion of owner-farmers declined to 33.33%, whereas the share of agricultural laborers increased to 40.00%. This indicates a significant shift in employment status from owner-farmers to farm laborers. Although the range of off-farm employment opportunities expanded, these jobs contributed little to improving farmers' welfare and mainly served as survival strategies.

Table 1: Changes in land ownership of rice farmers before and after the green revolution in Sereang village

No.	Land ownership (ha)	Before the green revolution		After the green revolution	
		Amount (persons)	Percentage (%)	Amount (persons)	Percentage (%)
1.	< 0.5	30	33.33	60	66.66
2.	0.5 – 1	45	50.00	21	23.33
3.	> 1	15	16.66	9	10.00
	Total	90	100.00	90	100.00

Table 2: Changes in employment status before and after the green revolution in Sereang village

No.	Employment status	Before the green resolution		After the green revolution	
		Amount (persons)	Percentage (%)	Amount (persons)	Percentage (%)
1.	Owner	51	56.67	30	33.33
2.	Cultivator	15	16.67	24	26.67
3.	Laborer	24	26.66	36	40.00
	Total	90	100.00	90	100.00

Previous studies on the Green Revolution in Indonesia highlight a similar pattern. While the program achieved remarkable economic success in terms of increased agricultural production, it also generated hardship for small farmers, increased dependency on developed countries, and disrupted established rural social structures. Research on farming communities in South Sulawesi, particularly rice-farming communities, has documented various aspects of these changes. Handayani et al. (2023) found that agricultural modernization led to both economic progress and the erosion of traditional norms. Sun (2024) observed the growing dominance of power elites and the weakening role of traditional elites. Dwomoh et al. (2023) identified a positive relationship between larger landholdings and higher income levels, while Budiandrian et al. (2022) reported changes in farmers' socio-economic conditions, particularly in income and education. Aji (2021) showed that the introduction of rice-harvesting technology transformed institutional arrangements, including profit-sharing systems, labor recruitment, and the division of labor. The findings of the present study similarly point to significant social change within farming communities.

However, existing research has not yet sufficiently examined South Sulawesi's farming communities as societies undergoing a broader transformation from traditional to modern forms. In particular, there is a lack of sociological studies comparing agricultural modernization through the Green Revolution with the subsequent marginalization of smallholder farmers and the resulting vertical and horizontal social mobility in this region.

Although many studies have analyzed social changes associated with the Green Revolution in Indonesia, they have not fully explained why small and poor farmers, who lack access to capital and other resources, have experienced declining production, loss of land, and increasing marginalization. In many cases, these conditions have forced them to leave agriculture and seek employment as industrial laborers in urban areas.

Overall, while most studies agree that the diffusion of agricultural technology is the primary source of social change in rural areas, there is considerable variation in how scholars interpret the mechanisms through which technological change shapes social transformation.

5. Conclusions

The results of this study show that the social structure of farming communities in rural areas consists of four main groups: large farmers who own extensive land and have strong control over the production process; medium farmers who own sufficient land to meet household needs; small farmers who have limited land and often work as agricultural laborers; and landless agricultural laborers who rely entirely on wage labor for their livelihoods.

Agricultural modernization and the introduction of new technologies through the Green Revolution have produced unequal impacts across social strata and gender groups, leading to significant changes in rural social structures. Social change is generally understood as a unidirectional, gradual, and progressive process that moves societies from less complex to more complex forms, resulting in increasingly similar social structures. From a modernization perspective, this process is characterized by several key features: (i) modernization is gradual, (ii) it promotes homogenization, (iii) it is largely irreversible, (iv) it requires a long period of time, (v) it is systemic, and (vi) it involves structural transformation.

This study identifies five main driving forces of social change: (i) demographic change, (ii) urbanization, (iii) shifts in social stratification, (iv) social movements, and (v) industrialization and technological development. Each of these factors contributes to social change in rural farming communities, although some play a more dominant

role than others. A prime mover refers to the factor that has the strongest influence in initiating social transformation.

Social change has led to new patterns of integration in agriculture, including the emergence of new forms of labor relations and social institutions. These include: (i) farmers who once controlled large areas of land experiencing land fragmentation or becoming tenant farmers or agricultural laborers; (ii) small landholders facing declining agricultural returns that are insufficient to meet household needs, prompting livelihood diversification; and (iii) shrinking cultivated land combined with labor surplus, which pushes rural workers to seek employment outside agriculture.

In South Sulawesi, particularly in Sidrap Regency, changes in agricultural labor relations have been driven by several interconnected processes: (i) declining land ownership due to land sales, inheritance, donation, or rental arrangements, which affects labor demand for both men and women; (ii) rapid population growth that increases labor supply; (iii) the adoption of modern agricultural inputs that raise production but also require consistent labor use; and (iv) mechanization that replaces human labor, particularly affecting small farmers. These processes have contributed to social polarization and intensified social stratification in rural areas.

While mechanization has reduced labor demand and accelerated the displacement of agricultural workers, it has also created limited new employment opportunities. However, rapid population growth has intensified pressure on rural households to seek low-income employment in non-agricultural sectors, particularly among those with low education and limited skills. At the same time, individuals with higher education and skills are more likely to be drawn into better-paid non-agricultural employment.

To reduce the marginalization of small farmers resulting from agricultural modernization, government policies should focus on creating employment opportunities within the agricultural sector, particularly through the development of downstream agro-processing activities. In addition, strengthening rural production institutions and farmer organizations is essential to improve the bargaining power, resilience, and economic sustainability of rural communities.

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Compliance with ethical standards

Ethical considerations

Ethical approval for this study was obtained from the Institute for Research, Development, and Community Service (LPPM), Universitas Muhammadiyah Makassar, Indonesia (Ethical Clearance No. 59/LP3M/05/A.4-VIII/XII/46/2024, approved on March 22, 2024). The study was categorized as a minor risk. All participants were informed about the objectives and procedures of the research, and their participation was entirely voluntary. Informed consent was obtained prior to data collection. Participants were assured of the confidentiality and anonymity of their responses, and all data were used solely for academic research purposes.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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