Research on the Impact of Production Relations on the Emancipation of New Quality Productivity in Agriculture

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Abstract

Under the background of the rural revitalization strategy and the vigorous development of new-quality productive forces, current research on new-quality productive forces has achieved fruitful results in various industries. However, there is a research gap in the impact of rural production relations on agricultural new-quality productive forces. Agricultural new-quality productive forces have reached a modern level. China's rural production relations have their own characteristics. These characteristics involve ownership of means of production, people's status and interrelationships in production, and distribution systems. Guided by relevant theories of Marxist philosophy, this study adopts the theoretical framework of the "four-element theory" of new-quality productive forces. A matrix analysis is conducted on the "three elements" of production relations. By setting dependent and independent variables, the impact of rural ownership of means of production is studied. The impact of people's status and interrelationships, and distribution systems on agricultural new-quality productive forces is also studied. Then the overall impact of rural production relations on agricultural new-quality productive forces is inferred.

Keywords

Agricultural new-quality productive forces, Rural development, Production relations, Rural revitalization

Introduction

With the continuous in-depth implementation of the rural revitalization strategy, rural development in China has embraced significant opportunities. Meanwhile, China has put forward the strategic decision to vigorously develop new-quality productive forces. As the primary and fundamental industry in China, agriculture requires the development of new-quality productive forces. This constitutes an inevitable prerequisite for modern new-style agriculture. It is also an inherent requirement for realizing rural revitalization. The liberation and development of productive forces call for matching production relations [1]. This raises a research question: Do China's current rural production relations satisfy the development demands of agricultural new-quality productive forces?

Literature review

Research progress of existing studies

Since the proposal of the new-quality productive forces strategy, academic research on its definition, measurement, evaluation and practical application has rapidly developed. It has formed relatively systematic research achievements, which have been widely recognized in academic circles. Existing research has thoroughly discussed the theoretical connotation and practical value of new-quality productive forces in multiple industries. Meanwhile, abundant results have been obtained regarding new-type production relations and their interactive relationship with new-quality productive forces. This is especially true in the secondary industry and tertiary industry [2].

In the agricultural field, scholars have also gradually enriched research on agricultural new-quality productive forces. They have continuously improved relevant theoretical systems. At the same time, research focusing on rural new-type production relations has also been increasing in recent years. Previous studies have fully affirmed the modern development achievements of

agricultural productive forces. Supported by smart agriculture, digital agriculture, intelligent agricultural machinery, agricultural drones and high-end agricultural talents, modern agriculture has realized the transformation from traditional manual farming to intelligent and modern farming. This has formed a new agricultural development pattern summarized as "plough-oxen retire from farmland, iron-oxen take over farming, farmers move to cities, and experts engage in agricultural production" [3].

Current studies have also clarified the basic framework and operating mechanism of China's rural production relations. In terms of production material ownership, rural areas adhere to collective ownership and implement the household contracted management system based on the "separation of two rights". With the continuous advancement of rural reform, the "separation of three rights" policy has further optimized the rural land system. It has realized the separation of contract rights and management rights, activated land management rights, and promoted large-scale and modern agricultural operation [4].

In terms of producers' status and social relations, farmers remain the main body of agricultural production and operation. Farmers can carry out independent family operation or join new agricultural operating entities through the "three transformations" model to realize large-scale and organized agricultural production. In terms of distribution system, rural areas adhere to distribution according to work as the main body. This is supplemented by diversified income modes such as land circulation rent, cooperative shareholding dividends and collective asset income distribution [5].

In addition, existing research has confirmed that China's urban and rural production relations present an obvious dual structure. Urban areas implement state ownership and are dominated by the state-owned economy. Rural areas implement collective ownership and are dominated by the collective economy, forming a long-term urban-rural institutional difference.

Problem statement

Although existing studies have formed rich theoretical achievements on new-quality productive forces and rural production relations, most studies focus on industrial and service industries. In the agricultural field, relevant studies mostly discuss agricultural new-quality productive forces or rural production relations separately. At present, there is still an obvious research gap in the in-depth empirical and theoretical analysis of the impact of rural production relations on the development of agricultural new-quality productive forces [6].

Under the background of rural revitalization and the vigorous development of new-quality productive forces, the modernization level of agriculture has been continuously improved. Whether the current rural production relation system can adapt to, support or restrict the development of agricultural new-quality productive forces has become an important research question. Therefore, this paper focuses on the rural production relation system. It analyzes its structural dimensions including ownership, production subject relationship and distribution system. It explores its influence on the development of agricultural new-quality productive forces.

Research hypotheses

Based on the above literature review and research gaps, this paper proposes the following research hypotheses.

Hypotheses 0 (H0): Rural production relations have a significant impact on the development of agricultural new-quality productive forces.

Hypotheses 1 (H1): The ownership of rural means of production has a significant impact on the development of agricultural new-quality productive forces.

Hypotheses 2 (H2): The status and mutual relations of rural producers in production have a significant impact on the development of agricultural new-quality productive forces.

Hypotheses 3 (H3): The rural distribution system has a significant impact on the development of agricultural new-quality productive forces [7].

Research methodology

Research methods

Guided by Marxist theories concerning productive forces, production relations, and their interaction, this paper adopts the "four elements" from the "quaternary theory" theoretical framework of new-quality productive forces as dependent variables. It also takes the "three elements" of production relations as independent variables for matrix analysis. This design aims to examine the influencing relationship between rural production

relations and new-quality productive force [8]. The overall analytical logic is illustrated in Figure 1.

$$\begin{bmatrix} \text{Production Of Relations（ROP）} & \text{New-Quality Productive Forces（NQPF）} \\ \text{Ownership Means of Production（ROP}-\text{Z）} & \text{Laborers of NQPF（NQPF}-\text{L）} \\ \text{People of Ralations（ROP}-\text{P）} & \text{Means of Production of NQPF（NQPF}-\text{P）} \\ \text{Distribution System（ROP}-\text{S）} & \text{Subject of Labour of NQPF（NQPF}-\text{F）} \\ & \text{New Production Factors（NQPF}-\text{N）} \end{bmatrix}$$

Figure 1. Matrix diagram of influences between production relations and new-quality productive forces.

Quantitative measurement and variable description

Specific variable parameters and detailed descriptions adopted for the empirical analysis in this study are systematically presented in Table 1.

Table 1. Quantitative measurement and variable description.

Variable name	Variable type	Variable code	Variable description	Variable value
Productive forces	DV	PF	Human capacity to transform nature.	[0,1]
New-quality productive forces	DV	NQPF	Human capacity to transform nature empowered by new technologies and new production factors.	[1,+∞]
Labourers	DV	NQPF_L	Capacity represented by the first dimension of new-quality productive forces.	[0,1]
Means of production	DV	NQPF_P	Capacity represented by the second dimension of new-quality productive forces.	[0,1]
Subject of labour	DV	NQPF_F	Capacity represented by the third dimension of new-quality productive forces.	[0,1]
Fourth factor	DV	NQPF_N	Capacity represented by the N-th dimension of new-quality productive forces.	[1,2]
Production relations	IV	ROP	Aggregate of human-object and interpersonal relations generated in the production process.	-1:Backward 0: Moderate +1: Advanced
Ownership of the means of production	IV	ROP_B	Analysis is confined to the ownership of agricultural land, land-operation organizations and market-oriented degree of land transfer.	-1:Backward 0: Moderate +1: Advanced
People of ralations	IV	ROP_P	Analysis is confined to the adaptability of organizational forms and management modes of rural production activities to modern-day development.	-1:Backward 0: Moderate +1: Advanced
Distribution system	IV	ROP_S	Analysis is confined to the adaptability of rural economic ownership institutions to modern-day development.	-1:Backward 0: Moderate +1: Advanced

Research subjects

Based on the research hypotheses, research methods and variable parameters of this paper, the research subjects of this study focus on inferring the influence of rural production relations on agricultural new-quality productive forces. This is achieved by examining the effects of rural ownership of the means of production. It also examines the status and mutual relations of rural labourers within the production process. Additionally, it considers the rural distribution system on agricultural new-quality productive forces, as illustrated in Figure 2. This framework clearly clarifies how each individual dimension of production relations contributes to the overall analysis.

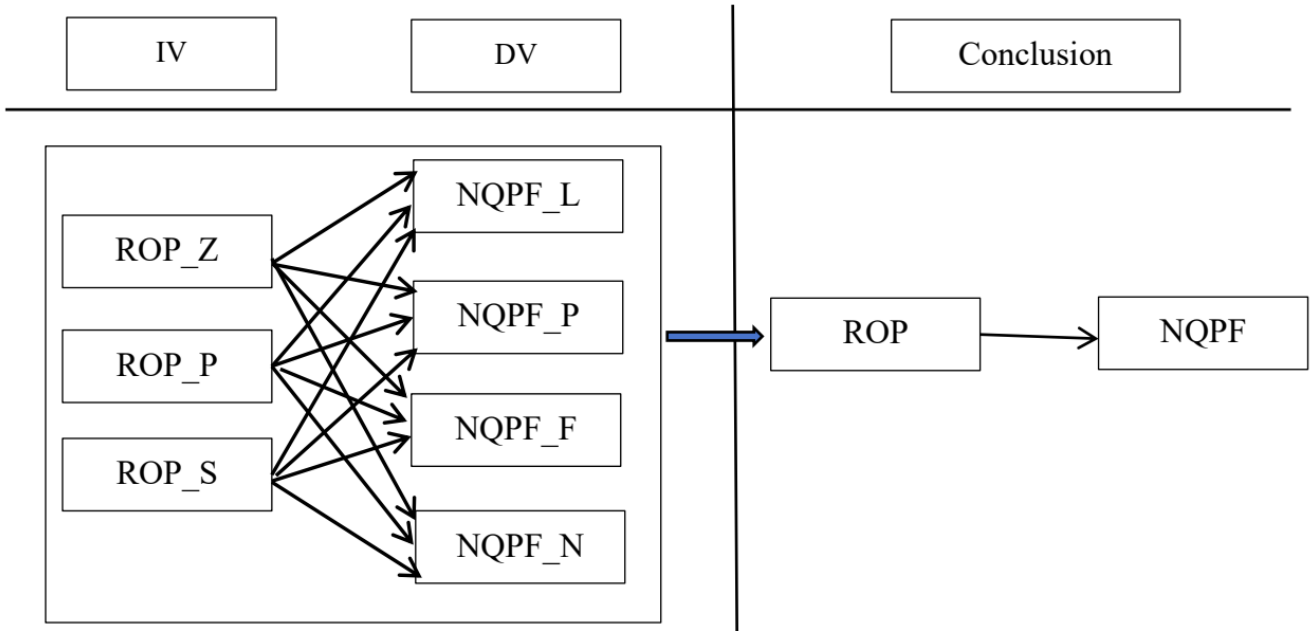

Figure 2. Schematic diagram of research subject description.

Analytical model of the "Four-Dimension Theory" of new-quality productive forces

Three elements of productive forces

In *Das Kapital*, Marx put forward that labourers, instruments of labour and subjects of labour jointly constitute the basic form of productive forces. As the most dynamic factor within productive forces, labourers possess subjective initiative. They can apply instruments of labour to act upon subjects of labour and create material and spiritual wealth. Instruments of labour, also known as means of labour, refer to the material materials or material conditions used by people to alter or affect subjects of labour in the labour process. They mainly include production tools, among which production tools constitute the core component. Subjects of labour are all objects processed by humans in the course of production. They can be divided into natural substances and raw materials processed by humankind. Each element evolves with the development of human practice and technological progress. Their mutual adaptation determines the overall level and efficiency of productive forces.

These three elements do not operate in isolation; rather, they interact and condition one another within the labour process, shaping each other continuously through feedback and mutual adjustment, thereby forming an organic unity that drives the development of productive forces. This unity is dynamic and historically grounded.

The fourth element of productive forces

Scientific and technological innovation has been proposed as the fourth element driving digital new-quality productive forces. Digital transformation has been argued to act as the fourth element for firms' new-quality productive forces. Data factors and scientific-technological innovation have been pointed out to constitute the fourth element of new-quality productive forces. Artificial intelligence has been held to be the fourth element promoting the development of corporate new-quality productive forces. Green technology has also been identified as a fourth element in certain frameworks. Similarly, talent cultivation has been proposed as another fourth element in recent discussions. These competing claims collectively suggest that the fourth element remains conceptually unsettled.

Furthermore, Alfred Marshall in *Principles of Economics* and Chen Yang in *Entrepreneurs and Entrepreneurial Talent* proposed that entrepreneurial talent represents the fourth element of productive forces. As reflected in existing scholarly studies, research conclusions concerning the "fourth element" of new-quality productive forces vary across contexts, enterprises and industrial forms [9].

Drawing on Marx's theory of the "three elements of productive forces" from *Das Kapital*, this paper incorporates domestic and international scholarly research on element theory. It argues that the fourth

element driving new-quality productive forces is defined as N. Its value changes dynamically according to specific contexts and industrial forms [10].

Analytical model of rural production relations and the "Four-Dimension Theory" of agricultural new-quality productive forces

The influence of rural production relations on new-quality agricultural productive forces can be analysed through the "Four-Dimension Theory". The specific analytical procedures are presented in detail below.

Step 1: Analysis of agricultural new-quality productive forces. By analysing the proportion of educational attainment, professional titles, technical skills and other indicators among rural labourers (NQPF_L), the capacity of labourers to transform nature (NQPF_W1) is obtained, with a value range of [0,1]. Here, 0 stands for the lowest comprehensive capacity and 1 for the highest comprehensive capacity; the same definition applies hereinafter.

By analysing the digitalisation, intellectualisation, mechanisation, unmanned operation and efficiency level of agricultural means of production (NQPF_P), the capacity of means of production to transform nature (NQPF_W2) is derived.

Through comprehensive analysis of subjects of labour (NQPF_F), namely land connectivity, machinery-suitability level and field management standards, the production capacity of subjects of labour (NQPF_W3) is determined. This capacity reflects how effectively these three factors work together in practice.

Via comprehensive evaluation of the informatisation level, seed-industry development, scientific-technological irrigation, unmanned agricultural machinery and other indicators of the fourth element of agricultural new-quality productive forces (NQPF_N), together with its improvement effect exerted on the preceding three elements, the capacity of the fourth element of agricultural new-quality productive forces to transform nature (NQPF_W4) is calculated, whose value ranges from [1,2]. This calculated capacity captures the fourth element's direct and indirect contributions.

Step 2: Determine the weights reflecting each of the four elements' impacts on agricultural new-quality productive forces according to practical conditions. The corresponding weights for each element are denoted as NQPF_D1, NQPF_D2, NQPF_D3 and NQPF_D4 respectively.

The analyses for Step 1 and Step 2 are presented in Table 2.

Table 2. Summary table for analysis of each element of agricultural new-quality productive forces.

Variable name and code	Main parameters	Value range	Result code	Weight code
Labourers (NQPF_L)	Proportions of educational attainment, professional titles, and technical skills among practitioners	[0,1]	$NQPF_W_1$	$NQPF_D_1$
Agricultural means of production (NQPF_P)	Digitalisation, intellectualisation, mechanisation, unmanned-operation and efficiency level	[0,1]	$NQPF_W_2$	$NQPF_D_2$
Subject of labour (NQPF_F)	Land connectivity, machinery-suitability level and field management level	[0,1]	$NQPF_W_3$	$NQPF_D_3$
Fourth element (NQPF_N)	Informatisation level, seed-industry development level, technological irrigation level, unmanned agricultural machinery level, etc.	[1,2]	$NQPF_W_4$	$NQPF_D_4$

Step 3: Calculate the comprehensive new-quality productive forces NQPF_W via Equation:

$$NQPF_W = \sum_{i=1}^{n}\left(NQPF_{W_i} * NQPF_{D_i}\right) \quad (1)$$

Step 4: Determine the values of the three corresponding elements of production relations according to the parameters listed in Table 3.

Table 3. Parameter table for value judgement of the three elements of production relations.

Variable name and code	Main indicators	Value	Result code	Weight code
Ownership of the means of production (ROP_Z)	Land: 1. More than 10% collectively controlled; 2. Land transfer rate above 60%; 3. Over 70% of land entrusted with no less than two links of socialised agricultural production services; 4. Over 70% of land under contiguous operation of more than 20 mu.	-1: 0 item 0: 1 item 1: >1 item	ROP_W_1	ROP_D_1
Status and Mutual Relations of Labourers (ROP_P)	1. Completion of the "Three-Transformation" reform; 2. Possession of collective-owned enterprises; 3. Existence of new-type business entities; 4. Dynamic management team of village economic cooperatives.	-1: 0 item 0: 1 item 1: >1 item	ROP_W_2	ROP_D_2
Distribution System (ROP_S)	1. Land rent accounts for more than 50%; 2. Availability of dividend distribution; 3. Villagers' income increase within the village accounts for over 50% of total income growth; 4. More than 50% of villagers are employed locally in the village.	-1: 0 item 0: 1 item 1: >1 item	ROP_W_3	ROP_D_3

Step 5: Determine the weights of impacts exerted by the three elements of production relations according to practical conditions. The corresponding weights for each element are denoted as ROP_D1, ROP_D2 and ROP_D3 respectively.

Step 6: Calculate the influence value ROP_W of rural production relations via Equation:

$$ROP_W = \sum_{i=1}^{n}\left(ROP_{W_i} * ROP_{D_i}\right) \quad (2)$$

Step 7: Calculate each influence-magnitude value according to the corresponding conditions in Table 4.

Table 4. Table for calculation of each influence-magnitude value.

Combinations of independent and dependent variables	Correspon-ding hypothesis	Result code	Calculation formula
ROP_Z VS NQPF_L	H1	RN_1	RN_1=ROP_D_1 * ROP_W_1 * NQPF_W_1NQPF_D_1
ROP_Z VS NQPF_P	H1	RN_2	RN_2=ROP_D_2 * ROP_W_2 * NQPF_W_2NQPF_D_2
ROP_Z VS NQPF_F	H1	RN_3	RN_3=ROP_D_3 * ROP_W_3 * NQPF_W_3NQPF_D_3
ROP_Z VS NQPF_N	H1	RN_4	RN_4=ROP_D_4 * ROP_W_4 * NQPF_W_4NQPF_D_4
ROP_P VS NQPF_L	H2	RN_5	RN_5=ROP_D_5 * ROP_W_5 * NQPF_W_5NQPF_D_5
ROP_P VS NQPF_P	H2	RN_6	RN_6=ROP_D_6 * ROP_W_6 * NQPF_W_6NQPF_D6$_1$
ROP_P VS NQPF_F	H2	RN_7	RN_7=ROP_D_7 * ROP_W_7 * NQPF_W_7NQPF_D_7
ROP_P VS NQPF_N	H2	RN_8	RN_8=ROP_D_8 * ROP_W_8 * NQPF_W_8NQPF_D_8
ROP_S VS NQPF_L	H3	RN_9	RN_9=ROP_D_9 * ROP_W_9 * NQPF_W_9NQPF_D_9
ROP_S VS NQPF_P	H3	RN_10	RN_10=ROP_D_{10} * ROP_W_{10} * NQPF_W_{10}NQPF_D_{10}
ROP_S VS NQPF_F	H3	RN_11	RN_11=ROP_D_{11} * ROP_W_{11} * NQPF_W_{11}NQPF_D_{11}
ROP_S VS NQPF_N	H3	RN_12	RN_12=ROP_D_{12} * ROP_W_{12} * NQPF_W_{12}NQPF_D_{12}

Step 8: Based on Step 1 to Step 7, calculate the corresponding influence degree RN_0 of rural production relations on agricultural new-quality productive forces, as shown in Equation:

$$RN_0 = \sum_{i=1}^{n}(ROP_{W_i} * ROP_{D_i}) * \sum_{i=1}^{n}(NQPF_{W_i} * NQPF_{D_i}) \quad (3)$$

Step 9: Judge whether to accept the corresponding hypothesis according to the calculated results. A positive value indicates rejection of the hypothesis with existing influence; the larger the value, the stronger the influence. A negative value indicates rejection of the hypothesis with negative influence; the larger the absolute value, the stronger the negative influence. A value of 0 indicates acceptance of the hypothesis, namely no influence exists.

Results

Research subjects

This paper takes five villages in Qingyuan City, Guangdong Province as examples to analyse the analytical model constructed in this study. The basic information of the five villages is shown in Table A1 and A2 (see Appendix).

Data investigation and analysis

After quantifying the survey data of Village A, equal weights are assigned to all indicators. The data are substituted into Table 3, and the calculation results are presented in Table 6.

Table 6. Calculation table of influence magnitude for Village A.

Combinations of independent and dependent variables	Correspon-ding hypothesis	Result code	Value	Hypothesis acceptance status
ROP_Z VS NQPF_L	H1	RN_1	0.962	Rejected
ROP_Z VS NQPF_P	H1	RN_2	0.867	Rejected
ROP_Z VS NQPF_F	H1	RN_3	0.889	Rejected
ROP_Z VS NQPF_N	H1	RN_4	0.985	Rejected
ROP_P VS NQPF_L	H2	RN_5	0.000	Accepted
ROP_P VS NQPF_P	H2	RN_6	0.000	Accepted
ROP_P VS NQPF_F	H2	RN_7	0.000	Accepted
ROP_P VS NQPF_N	H2	RN_8	0.000	Accepted
ROP_S VS NQPF_L	H3	RN_9	0.000	Accepted
ROP_S VS NQPF_P	H3	RN_10	0.000	Accepted
ROP_S VS NQPF_F	H3	RN_11	0.000	Accepted
ROP_S VS NQPF_N	H3	RN_12	0.000	Accepted

The survey data of Villages B, C, D and E were quantified and computed in the same manner, and the data analysis results are as follows. All values of Village B range from 0.823 to 0.982; hypotheses H0, H1, H2 and H3 are all rejected, indicating significant influences.

For Village C, the eight groups of data related to ROP_Z and ROP_S are all negative, falling within -0.026 to -0.127. The other four groups take positive values ranging from 0.0690 to 0.0863. The hypotheses are rejected, which suggests negative influences with low magnitude.

In Village D, the four groups of data associated with ROP_P are negative, ranging from -0.684 to -0.812. The hypotheses are rejected, representing strong negative influences. The remaining datasets are positive, between 0.526 and 0.639; the corresponding hypotheses are rejected, implying mild positive influences.

All calculated values for Village E are above zero, ranging between 0.497 and 0.986. The hypotheses are rejected, demonstrating positive influences. Nevertheless, substantial fluctuations and deviations exist across different items [10].

Main results

Comparative analysis yields the following results for the five surveyed villages in Qingyuan City, Guangdong Province.

Village A: The original hypotheses H2 and H3 are accepted. For Village A, the status and mutual relations of rural labourers in production exert influences on the development of agricultural new-quality productive

forces, and the rural distribution system also generates influences. Meanwhile, rural ownership of the means of production imposes effects on agricultural new-quality productive forces. Accordingly, rural production relations have impacts on the development of agricultural new-quality productive forces, yet the magnitude of such impacts is low [11].

Village B: Hypotheses H0, H1, H2 and H3 are all rejected, indicating that all factors produce influences with relatively high magnitude.

Village C: The datasets corresponding to H1 and H3 are negative, and the original hypotheses are rejected, which points to negative influences of small absolute values and low impact magnitude. The dataset for H2 is positive; the original hypothesis is rejected, showing strong positive influences with relatively large values.

Village D: The dataset corresponding to H2 is negative and the hypothesis is rejected, representing substantial negative influences. The remaining datasets are positive and their corresponding hypotheses are rejected, suggesting mild positive influences.

Village E: All datasets take positive values, and all hypotheses are rejected, demonstrating positive influences. Nonetheless, considerable fluctuations and deviations are observed across different items.

Discussion

Based on the field investigation and empirical analysis of five villages in Qingyuan City, Guangdong Province, this study systematically explores the influence of rural production relations on agricultural new-quality productive forces. The empirical results reveal heterogeneous characteristics across different villages, which fully reflects the complexity and diversity of rural development in China [12].

In terms of the ownership of the means of production, Village B and Village E show significantly positive effects. This indicates that reasonable land collective management, land transfer, and entrusted socialised agricultural production services are conducive to the improvement of agricultural new-quality productive forces. By contrast, Village C fails to meet the relevant evaluation criteria in this dimension, resulting in adverse inhibitory effects. This finding suggests that the optimisation and improvement of rural production material ownership are essential to adapt institutional arrangements to the development demands of agricultural new-quality productive forces.

The status and mutual relations of labourers in production also exert a critical influence on the growth of agricultural new-quality productive forces. Village B, Village C, and Village E present positive influences at varying degrees. This demonstrates that the establishment of collective enterprises and new-type agricultural business entities can effectively facilitate the development of agricultural new-quality productive forces. It also shows that the dynamic operation of village economic cooperatives can do the same. However, Village C shows a substantial negative influence in this dimension. It is necessary to further strengthen rural organisational construction and enhance farmers' participation and cooperation efficiency in agricultural production [13].

The distribution system constitutes an indispensable driving factor for the development of agricultural new-quality productive forces. Village A and Village B achieve positive outcomes in terms of rural distribution mechanisms, while Village C performs poorly in this regard. This comparison verifies that a sound distribution system can effectively stimulate farmers' production enthusiasm and boost the advancement of agricultural new-quality productive forces. Such a system is characterised by reasonable land rent distribution, dividend mechanisms, and local employment and income growth for villagers.

In addition, significant inter-village differences are identified in the core elements of agricultural new-quality productive forces. In terms of labourer quality, some villages possess abundant college-educated residents and young labourers, whereas others suffer from a shortage of high-quality talent. In terms of production materials, certain villages are equipped with advanced agricultural machinery and have basically realised smart agriculture, while others still rely on traditional backward farming modes. These differences indicate that targeted and localised development strategies should be formulated according to actual rural conditions to promote the high-quality development of agricultural productive forces [14].

This study also has several limitations. First, the research sample is limited to five villages in Qingyuan City,

Guangdong Province. It may not fully represent the overall situation of rural areas nationwide. Second, the selection of evaluation indicators and the determination of weights contain certain subjective biases. Future research can expand the sample coverage. It can also adopt more scientific and standardised indicator systems and weighting methods. This would further improve the accuracy and reliability of empirical research results.

Conclusion

By constructing a quaternary analytical framework for rural production relations and agricultural new-quality productive forces, this study conducts an empirical analysis based on survey data of five villages in Qingyuan City, Guangdong Province. The research results verify that rural production relations exert a significant regulatory influence on agricultural new-quality productive forces. The influencing intensity varies distinctly among villages in three core dimensions: ownership of the means of production, labourers' status and mutual relations, and rural distribution systems.

Specifically, rational ownership of agricultural production materials can positively promote the development of agricultural new-quality productive forces. Harmonious labour relations in rural production also contribute. Scientific income distribution systems further support this development. Conversely, imperfect institutional arrangements will generate negative inhibitory effects. Therefore, targeted adjustment and optimisation of rural production relations are essential. They adapt institutional systems to the iterative upgrading of agricultural new-quality productive forces.

This study also provides practical implications for rural revitalisation and agricultural modernisation. Governments and relevant departments should further deepen the reform of rural land systems to promote orderly land transfer and large-scale contiguous operation. It is necessary to increase policy support for new-type rural business entities and improve the organisational degree of farmers' production activities. Optimising rural income distribution mechanisms can effectively increase farmers' disposable income and mobilise their initiative in agricultural production. Furthermore, priority should be given to improving farmers' comprehensive quality and strengthening agricultural scientific and technological innovation. This would accelerate the modernisation and intelligent transformation of agriculture.

In summary, rural production relations are closely coupled with agricultural new-quality productive forces. Optimising and improving rural institutional arrangements can effectively empower the development of agricultural new-quality productive forces and ultimately realise the strategic goal of comprehensive rural revitalisation.

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Conflicts of Interest

The author declares no conflict of interest.

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Appendix

Table A1. Descriptive information of five villages in Qingyuan City: NQPF indicators.

Item	Village A	Village B	Village C	Village D	Village E
NQPF_L	No collegeeducated residents, no certified rural machinery operators, no young people	30% collegeeducated residents; tractor operators available; no young people	Young people account for more than 50%; no collegeeducated residents; no agricultural machinery operators	A large number of agricultural machinery operators; no collegeeducated residents; few young people	Few agricultural machinery operators; abundant collegeeducated residents; few young people
NQPF_P	Abundant advanced agricultural machinery; smart agriculture basically realised	Abundant advanced agricultural machinery; smart agriculture basically realised	Barely any agricultural machinery; dominated by traditional farming	Scant agricultural machinery; backward farmland management	Abundant advanced agricultural machinery; smart agriculture basically realised
NQPF_F	No land transfer; collective forest farm available; collective construction land for lease	Land transfer rate above 90%; collective land available; high machinery-suitability level	No land transfer; no collective land; over 70% of land abandoned	60% land transfer rate; no collective land; land abandonment	Over 90% of land under collective operation; collectively-operated land available; high machinery-suitability level
NQPF_N	Low technological level	Relatively high level; seed-breeding technology available	Zero-tech content	Socialised agricultural machinery services available	Smart agriculture; unmanned farm constructed

Table A2. Descriptive information of five villages in Qingyuan City: ROP indicators.

Item	Village A	Village B	Village C	Village D	Village E
ROP_Z	Collective control above 10%; over 80% of land under contiguous operation above 20 mu	Collective control above 10%; land transfer above 60%	None of the criteria met	Land transfer above 60%; 75% land under agricultural machinery trusteeship	Collective control above 10%; 90% land under agricultural machinery trusteeship; all land under contiguous operation
ROP_P	Dividend distribution available	Collective-owned enterprises available; new-type business entities available	Dynamic management team of village economic cooperatives	None of the criteria met	Completion of the “Three-Transformation” reform; collective-owned enterprises available; new-type business entities available
ROP_S	Dividend distribution available	Land rent accounts for more than 50%; dividend distribution available; over 50% of villagers employed locally	None of the criteria met	Land rent accounts for 60%; over 50% of villagers employed locally	Land rent accounts for 70%; dividend distribution available; villagers’ income growth within the village accounts for 60% of total income growth