Postprint: Current Status, Problems and Countermeasures for Crop Rotation and Fallow of Cultivated Land in Jiangxi Province

Authors: Huang Guoqin, Zhao Qiguo

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Abstract

Currently, all regions nationwide are vigorously advancing pilot programs for exploring the implementation of farmland crop rotation and fallow systems in accordance with the strategic deployment requirements proposed by the Party Central Committee and the State Council to "explore the implementation of pilot programs for farmland crop rotation and fallow systems." To promote further research and policy formulation in Jiangxi Province and other regions with similar conditions, thereby providing references for implementing crop rotation and fallow pilot programs, this study investigates the current status of farmland crop rotation and fallow in Jiangxi Province through literature research and field investigations, analyzes existing problems, and proposes relevant countermeasures. The results indicate that current crop rotation of farmland in Jiangxi is characterized by low area proportion, diverse patterns, wide distribution, and significant benefits, while fallow currently mainly adopts two approaches: land retirement and leisure fallow. The study also identifies that current crop rotation in Jiangxi suffers from problems such as small scale, poor pattern design, inadequate management, and low benefits, while fallow is mostly passive, with issues including unreasonable area allocation, unsuitable fallow farmland, single pattern, irregular cycles, and inadequate compensation. Based on these identified problems, countermeasures and measures for promoting provincial pilot programs of the farmland crop rotation and fallow system in the future are proposed: (1) intensify publicity efforts to raise farmers' awareness; (2) formulate scientific planning and implement by category; (3) clarify scope and manage effectively; (4) improve conditions and create demonstration models; (5) establish reasonable compensation standards to protect farmers' interests; (6) increase investment and cultivate talent.

Full Text

Preamble

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Title: Current Situation, Issues and Countermeasures of Crop Rotation and Land Fallow in Jiangxi Province*

Authors: HUANG Guoqin[1], ZHAO Qiguo[2]
(1. Center for Ecological Science Research, Jiangxi Agricultural University / Specialized Committee of Farming of Jiangxi Provincial Agricultural Society, Nanchang 330045, China; 2. Institute of Soil Science, Chinese Academy of Sciences, Nanjing 210008, China)

Abstract: In response to the strategic deployment of "exploring the implementation of pilot programs for crop rotation and land fallow systems" proposed by the CPC Central Committee and the State Council, pilot projects are being vigorously promoted nationwide. To facilitate further research and policy development in Jiangxi Province and other regions with similar conditions, this study employed literature review and field investigation methods to examine the current status of crop rotation and land fallow in Jiangxi, analyze existing problems, and propose relevant countermeasures. The results indicate that current crop rotation systems in Jiangxi are characterized by low area coverage, diverse patterns, wide distribution, and significant benefits, while land fallow primarily takes two forms: conversion to forest/grassland and seasonal fallow. However, several issues were identified: rotation areas remain small, patterns are suboptimal, management is poor, and benefits are limited; meanwhile, fallow practices are mostly passive, with unreasonable areas, inappropriate field selection, monotonous patterns, irregular cycles, and inadequate compensation. Based on these findings, this paper proposes the following strategies for advancing provincial rotation and fallow systems: (1) intensify publicity to raise farmer awareness; (2) develop scientific planning with classified implementation; (3) define clear scope for effective management; (4) improve conditions and establish demonstration models; (5) determine reasonable compensation standards to protect farmer interests; and (6) increase investment and cultivate talent.

Keywords: Cultivated land; Crop rotation; Land fallow; Sustainable agricultural development; Jiangxi Province

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1.1 Current Status of Crop Rotation

Crop rotation represents the "essence" of China's traditional agriculture and constitutes a crucial technique in intensive cultivation. This practice has been widely applied and passed down through generations, and Jiangxi Province is no exception. Based on recent field investigations of crop rotation practices in Jiangxi, several distinct characteristics have emerged.

First, the proportion of rotation area remains low. Due to the large-scale cultivation of rice (double-cropping or single-cropping rice) that predominantly involves continuous cropping, only 15–20% of paddy fields in the province practice rotation, meaning 80–85% of rice paddies are under long-term continuous rice cultivation. Dryland rotation is slightly higher at 30–50%, representing a 15–20 percentage point increase compared to paddy fields.

Second, rotation patterns are highly diverse. In paddy fields, multiple systems exist: (1) Rice-cotton rotation, where cotton is planted in fields previously under long-term rice cultivation, implementing a "green manure-rice-rice → oilseed/cotton (2–3 years) → wheat-rice-rice" multiple-cropping rotation. This improves soil structure, reduces bollworm damage, and promotes dual harvests of grain and cotton, primarily practiced in cotton-growing regions such as Yongxiu County. (2) Rice-sugarcane rotation: Southern Jiangxi's traditional sugarcane zones alternate between "sugarcane fields" and "rice paddies," achieving mutual yield and efficiency gains for both crops. (3) Rice-sweet potato rotation: In red soil hilly areas like Yujiang, Dongxiang, and Jinxian counties, where irrigation conditions cannot be fundamentally improved, late rice is replaced with sweet potatoes to form a "green manure-rice-sweet potato" system. This intra- and inter-annual rotation avoids seasonal drought hazards (summer-autumn droughts) while increasing food and feed crop yields, playing a vital role in maintaining high and stable paddy field productivity. Additional patterns include rice-vegetable, rice-melon, rice-tobacco, rice-medicinal herb, rice-grass, rice-fish, rice-duck (integrated rice-duck farming), rice-shrimp, rice-frog, rice-seedling (woody plants), rice-flower, and rice-fruit rotations. Dryland areas support even more crop varieties, resulting in more diverse multiple-cropping rotation systems than paddy fields.

Third, distribution is widespread. Rotation practices are broadly distributed across Jiangxi: rice-cotton rotation predominates in the Jiujiang region of northern Jiangxi; rice-sugarcane rotation is common in southern Jiangxi; rice-fish rotation is widely practiced in Poyang Lake areas; rice-tobacco rotation is concentrated in Xiajiang, Anfu, and Xingguo counties; rice-medicinal herb rotation is mainly found in Zhangshu City; and rice-vegetable rotation occurs primarily in suburban and peri-urban areas.

Fourth, benefits are substantial. As a soil-conserving practice adopted worldwide, rotation not only maintains or increases crop yields but also reduces weed infestation. Compared with continuous cropping, early rice yields increase by an average of 9.15% under rotation, while late rice yields increase by 5.96%. Ro-

tation also enhances soil microbial activity, increases beneficial microorganisms, and reduces harmful ones.

1.2 Current Status of Land Fallow

Land fallow represents an effective approach for farmland protection and a concrete action to implement the major national strategy of "storing grain in land and technology." Currently, Jiangxi employs several fallow methods from the perspective of farmland and ecological protection.

1.2.1 Conversion to Forest/Grassland

Following the catastrophic floods of 1998, China initiated pilot programs for converting degraded farmland to forest/grassland in Sichuan, Shaanxi, and Gansu provinces in 1999, with full implementation beginning in 2002 across 25 provinces/autonomous regions/municipalities and the Xinjiang Production and Construction Corps, covering 1,897 counties. Statistics show that from 1999 to 2016, the national program converted 16.711 million hectares, including 7.0025 million hectares of farmland and 9.7085 million hectares of barren hills suitable for afforestation.

Jiangxi officially launched its conversion program in 2001. From 2001 to 2010, the central government allocated a total task of 670,000 hectares, with 407,000 hectares completed between 2001 and 2005. According to a September 23, 2015 report in *China Green Times*, Jiangxi planned a new round of conversion covering 9,953 hectares across 28 counties in eight prefecture-level cities, including 6,520 hectares of sloping farmland above 25° and 3,707 hectares of 15–25° slopes in important water source areas, with compensation standards of 22,500 yuan per hectare. In addition to the conversion program, Jiangxi has implemented "returning farmland to lake" projects around Poyang Lake, playing a crucial role in ecological protection and flood reduction.

1.2.2 Seasonal Fallow

Jiangxi' s farmland fallow takes three forms: seasonal fallow, annual fallow, and long-term fallow (3–5 years or even 8–10+ years).

(1) Seasonal Fallow. This is common across Jiangxi, particularly as industrialization, urbanization, and modernization accelerate, causing rural labor migration to industry and cities. The resulting labor shortage has made "fields without people to cultivate" increasingly prevalent. Seasonal fallow includes three types: winter fallow, autumn fallow, and summer fallow, with winter fallow being most prominent.

Winter fallow is the most significant issue. Research by Wang Jijun et al. from the National Agro-Tech Extension Service Center shows that in 2012, southern China had 8.917 million hectares of winter fallow fields, with Jiangxi accounting for 712,000 hectares (7.98% of the southern total and 23.09% of Jiangxi' s total

cultivated area of 3.0835 million hectares). Recent investigations indicate that over 70% of Jiangxi' s paddy fields lie fallow in winter, with some areas exceeding 90%. This severely reduces winter agricultural resource utilization and productivity, affecting both immediate and long-term agricultural development.

Autumn fallow occurs when, after early rice harvest, lack of irrigation prevents timely late rice transplanting, or when summer-autumn droughts compromise yields. Consequently, some farmers abandon late rice cultivation, leaving approximately 266,700–400,000 hectares of paddy fields fallow in autumn. Autumn fallow also exists in dryland areas.

Summer fallow results from labor shortages and low profitability, preventing timely early rice transplanting and wasting valuable light, heat, water, and soil resources during the year' s most productive season.

(2) Annual Fallow. This involves leaving farmland completely uncultivated for an entire year. Such fallow fields suffer from trampling by humans and animals, weed infestation, and structural degradation, leading to deteriorated tillage properties. Annual fallow land is distributed throughout the province, estimated at 2–3% of total cultivated area, not exceeding 5%.

(3) Long-Term Fallow. This practice leaves farmland uncultivated for extended periods—3–5 years or even 8–10+ years—allowing it to "fend for itself." Without proper management, such fields inevitably become overgrown with weeds within a year, develop trees within three years, and transform into forestland within five years, making them impossible to cultivate. While not widespread in Jiangxi, such cases do exist.

2.1 Problems in Crop Rotation

Current crop rotation in Jiangxi faces several major challenges:

2.1.1 Insufficient Area Coverage

As previously noted, only 15–20% of paddy fields and 30–50% of dryland practice rotation, representing an overall small scale. Expanding rotation to 30–40% or even 60–70% of paddy fields, and to 60–70% or over 80% of dryland, would fully realize rotation benefits and promote sustainable agricultural ecosystem development.

2.1.2 Suboptimal Patterns

Although diverse rotation patterns exist in both paddy and dryland systems, their small scale and fragmented nature prevent them from achieving significant impact. To realize high-yield, high-efficiency rotation long-term, it is essential to consciously select and cultivate dominant rotation models that embody excellence in crop composition, intercropping arrangements, cultivation techniques,

and overall management. Scale, mechanization, and standardization must advance simultaneously.

2.1.3 Poor Management

Most existing rotation patterns suffer from extensive management practices that fail to unlock the full potential of crop production, model efficiency, and farmland income generation, creating a situation where "rotation is easy, but improving benefits is difficult." To address this, agricultural production management must be strengthened, particularly by applying the latest agricultural scientific and technological achievements—especially high-tech solutions—to rotation production, maximizing potential benefits for Jiangxi' s agricultural modernization.

2.1.4 Low Benefits

Rotation benefits typically manifest in multiple dimensions: yield increase, cost reduction, soil improvement, pest/disease/weed reduction, income growth, and enhanced economic, ecological, and social benefits. However, when rotation models are poorly selected or managed extensively, these inherent benefits often fail to materialize—precisely why current rotation practices show limited or insignificant benefits.

2.2 Problems in Land Fallow

Jiangxi' s land fallow practices face the following primary issues:

2.2.1 Predominantly Passive Fallow

Land fallow should be an active, proactive soil-conserving measure on arable land to restore soil fertility and ensure sustainable productivity. However, current fallow practices in the province are mostly passive, resulting from labor shortages, perceived lack of economic benefits (or low profitability), or poor land quality (such as pollution). These fields are often simply abandoned without management, constituting de facto abandonment rather than purposeful fallow.

2.2.2 Unreasonable Fallow Area Distribution

The distribution of fallow areas is unbalanced: winter fallow (winter fallow fields) is excessively large, while autumn and summer fallow areas are too small. Future adjustments should reduce winter fallow while appropriately increasing autumn and summer fallow. A "3-2-1" fallow system could be implemented, with winter fallow at 30%, autumn fallow at 20%, and summer fallow at 10% of cultivated area.

2.2.3 Inappropriate Field Selection

Investigations reveal that most current fallow fields are actually well-irrigated, fertile land that "doesn't deserve" to be fallowed. Conversely, many poorly irrigated, low-fertility fields that "should" be fallowed remain in cultivation.

2.2.4 Monotonous Fallow Patterns

Existing fallow patterns are overly simplistic and unrealistic, failing to achieve soil conservation or fertility restoration goals. Current "fallow" practices essentially mean "leisure"—leaving land uncultivated and unmanaged, inevitably leading to fertility decline, soil degradation, and deteriorated tillage properties that make subsequent cultivation difficult. Adopting active, diversified fallow patterns during fallow periods—such as soil loosening (to improve tillage properties), mulching (straw cover for water and soil conservation), and planting soil-improving crops (green manure, legumes)—would enhance land quality and benefit future production.

2.2.5 Irregular Fallow Cycles

Agricultural fallow should generally be short-term—one season or one year. Fallow periods exceeding one year (2–3 years or longer) with irregular, unpredictable cycles are detrimental to sustainable agricultural development. Currently, farmer-initiated "spontaneous" fallow practices in Jiangxi are predominantly irregular and long-term, undermining agricultural stability.

2.2.6 Inadequate Compensation

Since current fallow practices are mostly farmer-initiated and spontaneous, without inclusion in official fallow planning or government support, no "fallow compensation" or "ecological compensation" is provided. However, for future sustainability, planning should be formulated and economic compensation for fallow farmers should be established.

3. Countermeasures and Measures for Implementing Crop Rotation and Land Fallow

To address the aforementioned issues and promote rotation and fallow systems under the new normal, the following strategies should be adopted:

3.1 Intensify Publicity and Raise Farmer Awareness

Due to limited education, many farmers perceive rotation and fallow as disrupting their cultivation plans and reducing income, leading to resistance. Pilot programs must intensify publicity to help farmers understand the importance and necessity of these practices under China's new economic normal. Traditional concepts of "multiple cropping, high yield, high efficiency" must shift to-

ward green, sustainable development concepts where rotation and fallow enable faster, better future development. Effective publicity is essential to fundamentally change outdated farmer perceptions.

3.2 Develop Scientific Planning with Classified Implementation

Crop rotation and fallow are systematic, long-term endeavors requiring reasonable planning and strict supporting measures for successful implementation. Jiangxi' s pilot programs should focus on: (1) heavy metal contamination zones, especially farmland surrounding industrial enterprises like Dexing Copper Mine, Guixi Smelter, and Yongping Copper Mine; (2) soil erosion areas, including sloping farmland in southern Jiangxi mountains, red soil hilly dryland in northeastern Jiangxi, and severely eroded land around Poyang Lake; (3) continuous cropping obstacle zones, such as greenhouse vegetable operations near cities with excessive inputs and severe pest/disease/weed problems; (4) water-deficient drought zones where irrigation is unavailable and summer-autumn droughts necessitate rotation/fallow; and (5) non-point source pollution zones surrounding large livestock farms (pig, cattle, chicken, duck operations) where adjacent water bodies and farmland require rotation/fallow and water rest (fishing moratorium).

For each zone, principles, standards, operational criteria, and specific requirements should be established, providing integrated guidance and services from training through implementation to ensure effective, practical, and results-oriented rotation and fallow practices.

3.3 Define Clear Scope for Effective Management

Rotation and fallow systems require clear delineation of farmland area and scale, with scientific, dynamic management of fallow land. Fields unsuitable for fallow must not be included. To prevent large-scale abandonment while addressing farmers who refuse to fallow their contracted land for personal economic interests, effective management is essential. Farmers should be encouraged to plant green manure crops on fallow land to improve fertility, while agricultural technology departments develop suitable tillage methods for different soil types to ensure rotation and fallow achieve desired objectives.

3.4 Improve Conditions and Establish Demonstration Models

To smoothly advance pilot programs, existing agricultural production conditions must be improved, particularly through enhanced farmland infrastructure. Irrigation and road facilities should be developed to ensure reliable water access and drainage, as well as accessible transportation. Representative counties, townships, and villages with solid foundations, mature conditions, and strong demonstration capacity should be selected at provincial, municipal, and county levels to establish rotation and fallow demonstration models. These “model sites”

should serve as learning examples for the province and even other provinces, actively contributing to the "Jiangxi model" for Beautiful China.

3.5 Determine Reasonable Compensation Standards to Protect Farmer Interests

Land is farmers' fundamental livelihood guarantee. With limited income, rotation and fallow implementation inevitably reduces grain output and affects farmer income. Therefore, reasonable compensation must be provided to ensure income stability and livelihood security. The government should establish detailed subsidy standards and operational procedures to guarantee farmers receive appropriate fallow subsidies.

In 2016, the Ministry of Agriculture and Ministry of Finance integrated project funds, with the central government allocating 1.436 billion yuan to support rotation and fallow pilots nationwide, including 750 million yuan for rotation and 686 million yuan for fallow. This significantly promoted national pilot programs. Jiangxi Province and relevant departments should also increase financial investment to ensure successful implementation and achieve expected results. Additionally, talent cultivation is crucial—training large numbers of officials and farmers who "understand rotation and know fallow," particularly frontline rural cadres and young farmers, to ensure genuine understanding, effective implementation, and tangible results.

References

[1] Xi J P. A note on the proposal of the Central Committee of the Communist Party of China on formulating the thirteenth five-year plan of national economic and social development[J]. New Long March, 2015, (12): 19-23
[2] "Opinions of The CPC Central Committee and State Council on the Implementation and Development of New Ideas to Accelerate Agricultural Modernization and Achieve a Comprehensive Well-off Target" (2016 Central First Document)[EB/OL]. China Agricultural News Network [2016-01-27]. http://www.farmer.com.cn/uzt/ywj/ge/201601/t20160128_{1176439}.htm
[3] To explore the implementation of a rotation system of cultivated land trial program[N]. People' s Daily, 2016-06-30 (11)
[4] China will initially establish a cropland fallow rotation organization system[N]. China Agri-Production News, 2016-07-08 (1)
[5] Deng L L, Wang J H, Liu J S, et al. Influence of fallow rotation on the black soil acidification[J]. Journal of Soil and Water Conservation, 2013, 27(3): 184-188
[6] Teng Y. How to carry out the fallow rotation of green farming repair?[J]. China Ecological Civilization, 2016, (4): 85
[7] Chen G Q, Zeng X S. The establishment of agricultural cropping system in China —The experience and inspiration from the history of agricultural development[J]. Sub National Fiscal Research, 2016, (7): 87-94
[8] Liu Z Z, Liu J, Zhou H C. Some problems and countermeasures of pilot

project of cultivated land cropping system[J]. China Economic & Trade Herald, 2016, (26): 18-19
[9] Jing L. Cultivated land fallow rotation is a major step forward in the ecological environment[J]. Country Agriculture Farmers, 2016, (7B): 14
[10] Liu X H. Farming Science[M]. Beijing: China Agriculture Press, 1996
[11] Huang G Q, Zhang T L, Zhao Q G. China' s Farming System in the South[M]. Beijing: China Agriculture Press, 1997
[12] Xie M. Benefit of tobacco-rice rotation and main technical measures[J]. Jiangxi Agricultural Science & Technology, 1989, (1): 11-12
[13] Huang G Q. Study on farmland circulation production technology in hilly area of Jiangnan —Development of rice rotation system in Jiangxi Province[J]. Modern Agricultural Science and Technology, 2008, (11): 231-233
[14] Huang G Q. Theory and Practice of Farming System in Jiangxi Province[M]. Nanchang: Jiangxi Science and Technology Press, 1996
[15] Blackshaw R E, Harker K N, O' Donovan J T, et al. Ongoing development of integrated weed management systems on the Canadian prairies[J]. Weed Science, 2008, 56(1): 146-150
[16] Cheng C P, Pan J F, Wan K Y, et al. Research advances in the effects of rotation on cropland weeds[J]. Chinese Agricultural Science Bulletin, 2013, 29(30): 1-9
[17] Huang G Q, Xiong Y M, Qian H Y, et al. Ecological analysis of crop rotation systems in paddy field[J]. Acta Pedologica Sinica, 2006, 43(1): 69-78
[18] Li W J, Yang D L, Zhao J N, et al. Progress on effects of long-term continuous cropping and rotation systems on farmland soil biological characteristics[J]. Chinese Agricultural Science Bulletin, 2015, 31(3): 173-178
[19] Xu T F, Xiao X Y. Existing problems of land using of converting cropland to forests in Jiangxi Province and its countermeasures[J]. Jiangxi Forestry Science and Technology, 2012, (3): 61-64
[20] Li Z C. Analysis on the construction of government ecological engineering —Taking "returning farmland to forest and grass" as an example[J]. Money China, 2016, (8): 352
[21] Zhong N Q. Jiangxi will implement a new round of land 14.93 million mu of forest[N]. China Green Times, 2015-09-23
[22] Wang J J, Xiong Y K, Zhou G S. Suggestions on development of rapeseed production in winter in South China[J]. China Agricultural Technology Extension, 2014, 30(5): 6-8
[23] Huang G Q. A discussion on the benefits of crop rotation[J]. Tillage and Cultivation, 2008, (4): 1-3
[24] Print Journalist. To explore the implementation of cultivated land rotation system of the pilot fallow to promote the sustainable use of resources and sustainable development of agriculture —Ministry of Agriculture Vice Minister, Yu Xinrong, on "to explore the implementation of cultivated land rotation system of the pilot program" [J]. Rural Work Newsletter, 2016, (15): 6-8

Note: Figure translations are in progress. See original paper for figures.