Key Issues in Constructing an Economic Compensation Mechanism for Cultivated Land Protection in Major Grain-Producing Areas: Evidence from 473 Household Surveys in Huaxian County, Henan Province (Postprint)

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Abstract

Establishing an economic compensation mechanism for farmland protection is a crucial measure for implementing current farmland protection policies. To scientifically and rationally construct an economic compensation system for farmland protection, this study, from the perspective of farmer cognition and based on survey data from 473 farmer households in Huaxian County, Henan Province, employs statistical data analysis methods to analyze key issues including the necessity of implementing economic compensation for farmland protection, compensation basis, compensation standards, compensation cycle, compensation fund distribution methods, compensation recipients, paying entities, fund management entities, and supervisory entities. The results indicate that farmers exhibit relatively high cognition regarding farmland protection; in the design of the economic compensation system for farmland protection, although farmers' cognitive level of the compensation system itself is relatively low, their recognition of the necessity of implementing such compensation is relatively high. The compensation cycle should be annual. The compensation basis should be farmland area. Regarding compensation standards, if farmland quality differences are considered, the compensation standards for high-, medium-, and low-grade land are 5 446.43 元 hm 2 a 1, 4 910.71 元 hm 2 a 1, and 4 481.71 元 hm 2 a 1, respectively; otherwise, the uniform economic compensation standard for farmland protection is 5 209.92 元 hm 2 a 1. The compensation recipients are farmer households, compensation funds should be distributed entirely to farmers, and both the paying and management entities are the central government. Finally, the paper recommends actively establishing and improving relevant systems and policies for economic compensation for farmland protection, raising actual compensation standards, establishing organizational structures for implementing

compensation, strengthening the collection, use, and management of compensation funds, and increasing publicity for farmland protection.

Full Text

Key Issues in Establishing an Economic Compensation Mechanism for Cultivated Land Protection in Main Grain-Producing Areas: Evidence from 473 Farmer Households in Huaxian County, Henan Province

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Abstract: Establishing an economic compensation mechanism for cultivated land protection represents a crucial measure for implementing farmland preservation policies. To construct a scientifically sound and rational compensation system, this study examines key issues including the necessity of compensation, compensation basis, standards, payment cycles, distribution methods, recipients, payers, and fund management entities, drawing on 473 farmer surveys from Huaxian County, Henan Province, and employing statistical data analysis from a farmer cognition perspective. The findings reveal that while farmers demonstrate high awareness of cultivated land protection, their understanding of the compensation system remains limited, though they strongly recognize its necessity. The compensation cycle should be annual, with land area serving as the basis. Regarding compensation standards, differentiated rates based on land quality yield values of 5,446.43 yuan $\cdot$ $hm^{-2} \cdot a^{-1}$, 4,910.71 yuan $\cdot$ $hm^{-2} \cdot a^{-1}$, and 4,481.71 yuan $\cdot$ $hm^{-2} \cdot a^{-1}$ for high-, medium-, and low-grade land, respectively; without quality differentiation, the uniform standard is 5,209.92 yuan $\cdot$ $hm^{-2} \cdot a^{-1}$. Farmers should be the primary recipients, with compensation funds distributed directly to them, while the central government should serve as both payment and management entity. The study concludes with recommendations to improve relevant policies and institutions, enhance compensation standards, establish organizational structures for implementation, and strengthen publicity efforts.

Keywords: cultivated land protection; economic compensation system; main grain-producing area; compensation mechanism

Introduction

Food security is fundamental to China' s national economy, people' s livelihood, and social stability. Main grain-producing areas serve as the primary vehicle for achieving food security, with 13 such regions currently accounting for over 75% of national grain output. In particular, seven provinces—Heilongjiang, Jilin, Liaoning, Inner Mongolia, Hebei, Shandong, and Henan—contribute approximately 50% of total national production [1]. However, these regions face

increasingly prominent challenges, including limited financial capacity, insufficient subsidies for grain farmers, heavy burdens for agricultural supporting funds, and local fiscal overload, creating a mismatch between their grain production obligations and economic capacity [2].

Under new circumstances, cultivated land protection in main grain-producing areas has become particularly critical for ensuring food security. Although China has implemented the world's strictest farmland protection system, the policy has historically emphasized constraints over incentives [3], leading to inefficient allocation of cultivated land resources [4]. The interests of farmers, as direct land custodians, have been neglected [5], and low agricultural returns have driven the diversification of farmer income sources away from farming, diminishing their intrinsic motivation to protect farmland [6]. This has resulted in land abandonment and extensive cultivation practices [7], yielding limited effectiveness in farmland preservation efforts [8]. The 2017 No. 1 Central Document explicitly called for "improving the benefit compensation mechanism for main grain-producing areas, stabilizing reward policies for major grain-producing counties" and "strictly guarding the red line of cultivated land while protecting and optimizing grain production capacity through comprehensive implementation of special protection policies for permanent basic farmland and actions to preserve and enhance land quality." These directives highlight the necessity of employing economic instruments to adjust economic relationships in farmland protection, establish a robust compensation system, and internalize the external benefits of land preservation to mobilize the enthusiasm of protection stakeholders.

Existing research on establishing farmland protection compensation systems has focused on three main aspects: (1) compensation models, with theoretical contributions from scholars such as Zhu Xinhua et al. [9], Zhou Xiaoping et al. [10], Niu Haipeng [11], Zhao Kai [6], and Yu Liangliang et al. [12]; (2) compensation standard calculations, as seen in studies by Ren Ping et al. [13], Chen Yangfen et al. [14], Wang Limin et al. [15], Chen Yanrui et al. [16], and Niu Haipeng et al. [17]; and (3) case analyses of compensation practices in typical regions, such as Lu Yanxia et al.' s [18] comparative study of Chengdu (Sichuan), Foshan (Guangdong), and Cixi (Zhejiang), and Zhu Lanlan et al.' s [19] empirical analysis of six regions with and without compensation systems. However, these case studies are limited by local characteristics and lack generalizability. Notably, research from the perspective of farmer willingness and cognition remains insufficient, despite farmers being the direct agents of land protection whose understanding of compensation standards, cycles, and distribution methods is crucial for system design.

On June 12, 2016, the Henan Provincial Department of Finance and Department of Agriculture jointly issued the "Implementation Plan for Cultivated Land Fertility Protection Subsidies in Henan Province in 2016," which consolidated three separate subsidies into a single "Agricultural Support and Protection Subsidy" aimed at supporting land fertility preservation and appropriately scaled grain operations. The subsidy standard is uniform within county-level administrative

regions, with the surveyed area receiving 1,515 yuan · hm^{-2}. Building on this policy context, this study uses Huaxian County in Henan Province—a representative main grain-producing region—and 473 farmer surveys to analyze key elements including the necessity, basis, standards, payment cycles, distribution methods, recipients, payers, and management entities of farmland protection compensation. The findings aim to promote rational benefit distribution between grain-producing and grain-consuming regions, coordinate inter-regional economic development, and inform the construction of a national compensation mechanism.

1.1 Study Area

Henan Province ranks as China' s second-largest grain-producing province, with 2016 output reaching 59.466 million tons (9.65% of national production). Huaxian County, located in northeastern Henan, enjoys favorable agricultural conditions and ranks first in grain production within the province, earning the reputation as the "Granary of Northern Henan" and achieving the unique distinction of 12 consecutive national awards as an advanced grain production county. In 2015, the county had 188,600 hectares of grain cultivation area, with average yield of 523.96 kg and total output of 1.482 billion kg, leading Henan Province for 24 consecutive years. However, the county faces severe challenges of decreasing cultivated land area, making it highly representative for studying land protection in core grain production zones.

1.2 Data Sources

The data derive from field surveys conducted in Huaxian County in December 2016. The questionnaire covered five aspects: household socioeconomic characteristics, land contracting and management, cognition and willingness regarding farmland protection, understanding and willingness to accept compensation, and validity checks. Random face-to-face interviews ensured high response rates and quality. Of 500 questionnaires distributed, 473 valid responses were collected (94.6% validity rate), sufficient for statistical analysis. The survey covered 38 villages across five towns: Baidao Town (23.26%), Dazhai Township (20.93%), Liugu Town (23.68%), Wagangzhai Township (10.78%), and Wangzhuang Town (21.35%). The spatial distribution is shown in [Figure 1: see original paper]. Provincial statistical data were sourced from the Henan Provincial Statistics Network.

1.3 Sample Characteristics

Among the 473 respondents, 69.77% were male and 55.18% were aged 40-60. Educational attainment was concentrated in primary and junior high school levels (75.69%), with junior high school graduates accounting for 47.15%. Households with 4-6 members comprised 46.72% of the sample, while 61.95% had two or fewer agricultural laborers. Households managing 0.4 hectares or more ac-

counted for 52.43%, and 73.36% engaged exclusively in agricultural production. Detailed descriptive statistics are presented in .

2.1 Farmers' Cognition of Cultivated Land Resource Protection

Changes in Cultivated Land Resources and Their Impact on Livelihoods. China' s rapid urbanization and industrialization have continuously reduced cultivated land quantity and quality through construction encroachment, agricultural restructuring, and ecological restoration, intensifying conflicts between socioeconomic development, population growth, and land resource protection [20]. This analysis examines both quantitative and qualitative dimensions.

Regarding land quantity, 208 respondents (43.97%) perceived recent decreases, 252 (53.28%) saw no significant change, and only 13 (2.75%) reported increases (), indicating severe land scarcity and pressing protection challenges. To assess impacts on livelihoods, respondents rated the influence of land quantity changes on their current and descendants' quality of life on a 100-point scale. For current life quality, 50.74% rated the impact as substantial (>60 points), while 13.74% perceived no impact, attributing this to low agricultural returns and farming no longer being their primary income source. For descendants' quality of life, 61.31% anticipated substantial impact, while 8.46% foresaw none, reasoning that future generations would not farm, technological advances would offset yield losses, and international markets could meet grain demand. These findings demonstrate that most farmers in grain-producing areas recognize the long-term implications of land reduction.

In terms of land quality, 169 households (35.73%) perceived improvements, 22 (4.65%) reported declines, and 282 (59.62%) observed no significant change. While farmers expressed concerns about excessive fertilizer and pesticide use affecting future productivity, large-scale government infrastructure projects improving irrigation systems have positively impacted land quality.

Extent and Causes of Land Degradation. Among 473 respondents, 95.56% recognized the importance of land protection (rating >60), while only 7.61% considered current degradation severe (), indicating high conservation awareness and relatively minor degradation in the study area. The primary causes identified were excessive chemical inputs (28.04%), followed by industrial pollution and domestic waste. Other factors included low grain profits, small per capita land holdings, weak protection incentives, illegal occupation, and infrastructure encroachment, highlighting the need to balance economic development with land protection.

Willingness to Participate in Conservation. A strong willingness to engage in land protection was expressed by 376 respondents (79.49%) with ratings in the (80,100] range, though this represents a 2.08 percentage point decrease from Niu Haipeng et al.' s [21] 2009 findings. This decline reflects both regional differences

and rising off-farm income opportunities that reduce farmers' dependence on and motivation for land protection.

2.2 Farmers' Cognition of Economic Compensation for Land Protection

Necessity of Compensation. Among surveyed farmers, 86.89% considered compensation "very necessary," 5.50% "necessary," and only 3.17% "completely unnecessary" (), demonstrating strong recognition of compensation' s practical significance.

Awareness and Information Channels. However, 85.62% had "never heard of" land protection compensation, with only 2.74% reporting "understanding" or "very good understanding" (). Information primarily came from internet and television news (63.24%), with minimal reliance on newspapers or government publicity. These results indicate low awareness and the need for diversified outreach through networks, notices, flyers, and village meetings to enhance farmers' rights consciousness and responsibility as direct protection agents.

3.1 Basis for Implementing Compensation

Among 473 respondents, 67.23% preferred area-based compensation, 5.07% favored output-based, 26.85% supported population-based, and 0.85% suggested income or cost-based approaches (). The strong preference for area-based compensation aligns with current practices in Chengdu and Dongguan.

3.2.1 Compensation Standards

Determining compensation standards is central to mechanism design. After excluding outliers, 324 valid responses remained, with 66.17% preferring area-based compensation. This analysis calculates standards from an area perspective, considering both quality-differentiated and uniform approaches.

Henan implemented land fertility subsidies in 2016 based on contracted land area (or second-round 承包面积 where certification was incomplete), with adjustments for converted land but without quality differentiation. Among 318 farmers preferring area-based compensation, 42 (13.2%) advocated quality-differentiated standards while 262 (86.8%) preferred uniform rates. Using midpoint values of response intervals (0-500, 500-1,000, and >1,000 yuan $\cdot$ hm^{-2}) weighted by response shares, expected compensation standards were calculated.

For quality-differentiated compensation, land grades were classified by wheat yield: low ([0, 1,500] kg $\cdot$ hm^{-2}), medium (1,500-7,500 kg $\cdot$ hm^{-2}), and high (>7,500 kg $\cdot$ hm^{-2}). The relatively small differentials reflect Henan' s limited grade variation—high-grade land comprises 6,407.4 thousand hectares (79.29%) and medium-grade 1,673.8 thousand hectares (20.71%), with no superior or

low-grade land [22]. The calculated standards are 5,446.43 yuan · hm^{-2} · a^{-1}, 4,910.71 yuan · hm^{-2} · a^{-1}, and 4,481.71 yuan · hm^{-2} · a^{-1} for high-, medium-, and low-grade land, respectively. The uniform standard is 5,209.92 yuan · hm^{-2} · a^{-1}, which aligns with pilot region rates (e.g., Foshan' s 3,000-7,500 yuan · hm^{-2} [18]). Henan' s standard is relatively modest due to economic development differences and timing—Henan' s 2015 per capita GDP was 39,123 yuan, compared to Jiangsu' s 87,995 yuan (2.25 times higher), and Suzhou' s compensation of 6,000 yuan · hm^{-2}.

3.2.2 Compensation Cycle and Distribution

For payment cycles, 43.13% preferred annual compensation, 39.96% quarterly, 14.16% monthly, and 2.75% other options (e.g., per cropping season or semi-annually) (), indicating a majority preference for annual payments.

Regarding distribution, 95.56% advocated full payment to farmers, 2.96% supported allocation between farmers and village collectives (with collectives receiving ~22.27% for infrastructure or enterprise development), and only 0.85% favored tripartite distribution among farmers, collectives, and local governments (each receiving ~18.33% for infrastructure and insurance, respectively) (). Direct payment to farmers offers practical operability, maximizes fund utilization, prevents misappropriation, enhances timeliness, and optimizes conservation effectiveness.

3.3.1 Recipients

Properly defining recipients and payers is crucial for system construction [23]. Recipients are providers of land externalities. Among respondents, 94.95% identified farmers as rightful recipients, as they invest labor and capital but only capture economic value, while ecological and social values remain uncompensated [16]. Only 0.81% and 3.64% selected local governments and village collectives, respectively (). Farmers strongly preferred direct payment through existing integrated bank cards for three reasons: (1) enhanced flexibility in allocating funds to improve soil fertility; (2) improved efficiency, as other entities lacking institutional constraints might pursue utility-maximizing actions that hinder conservation [15]; and (3) ensured timeliness to meet production needs.

For transferred land during contract periods, 45.57% favored payment to original contractors, while 49.89% preferred payment to actual operators (). Since actual operators perform most conservation work, they should receive compensation, with original contractors retaining supervisory roles.

3.3.2 Payers

Payers are beneficiaries of land externalities. Among respondents, 45.62% selected the central government, 28.21% local governments, 13.03% land occupiers, and 8.86% urban residents (). This aligns with research by Zhao Kai et al. [6] and Niu Haipeng et al. [21], who identified grain-deficit regions, urban residents,

and the state as funding sources. Land occupiers converting farmland to other uses appropriate its full value and should therefore contribute compensation.

3.3.3 Management Entities

For fund management, 60.25% preferred central government oversight, 32.14% local government, 1.06% village collectives, and 3.38% villager groups (). The low trust in collectives stems from their "triple-agent" characteristics, with villagers perceiving them as serving self or township interests over community welfare [24]. This contrasts with Chengdu' s practice of relying heavily on grassroots organizations [25], but aligns with scholarly consensus that collectives cannot be autonomous conservation actors [23]. Given credibility and efficiency considerations, the central government should manage compensation funds.

4 Conclusions, Discussion, and Recommendations

Establishing a cultivated land protection compensation mechanism represents a major rural land system reform. Main grain-producing areas are vital for food security, and their farmers constitute both the primary conservation agents and micro-level support units for national grain security. Analyzing key compensation elements from farmers' perspective thus holds significant practical importance.

Based on 473 farmer surveys from Huaxian County, this study examined cognition of land protection status and compensation system components, defining each element to enhance farmers' conservation enthusiasm while informing mechanism design. The findings indicate:

1. Farmers recognize land resource importance, scarcity, and urgency of protection, identifying excessive chemical inputs as the primary degradation cause.
2. Most farmers demonstrate strong conservation willingness, with 86.89% viewing compensation as highly necessary, though awareness remains low due to limited information channels.
3. Recipient and payer definition is fundamental: 94.95% selected farmers as recipients, while 45.62% and 60.25% chose the central government as payer and manager, respectively.
4. Most farmers support area-based, annual compensation. Quality-differentiated standards are 5,446.43, 4,910.71, and 4,481.71 yuan $\cdot$ hm^{-2} $\cdot$ a^{-1} for high-, medium-, and low-grade land, respectively; the uniform standard is 5,209.92 yuan $\cdot$ hm^{-2} $\cdot$ a^{-1}.

Discussion points merit attention. First, compensation standards must balance farmer willingness with central and local fiscal capacity. Henan' s current land fertility subsidy of 1,515 yuan $\cdot$ hm^{-2} is substantially lower than our estimates because it merely consolidates previous subsidies without considering land' s comprehensive value, and is constrained by local finances. Calculating standards based on fiscal capacity would enhance operability. Additionally,

this study did not elaborate on differences among farmer types due to efficiency and space constraints; future research should address these variations for more scientific results. Second, policy formulation is a systematic process requiring comprehensive consideration of farmer willingness, concurrent policies, and fiscal strength. While farmer perspectives are important, they represent only one input; policymakers should adjust findings holistically.

Recommendations include: (1) Establish and improve compensation institutions and policies, with local governments increasing subsidies for conservation practices like straw return, deep loosening, reduced chemical use, and organic fertilizer application to raise compensation standards and motivate farmers; (2) Create organizational structures to strengthen fund raising, utilization, and management, providing institutional guarantees; and (3) Enhance publicity to help farmers fully understand land resource values, importance, and their role as conservation agents, fostering spontaneous and conscious protection behaviors.

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