Research on the Impact of Land Transfer on Farmer Household Consumption through CAD Technology in Human-Computer Interaction

Kangkang Cheng[1*], S. M. Ferdous Azam[2] and Ali Khatibi[3]

[1,2,3]Postgraduate Centre (PGC), Management and Science University, University Drive Off Persiaran Olahraga, 40100 Shah Alam, Selangor, Malaysia
[2,3]Wuxi Institute of Technology, Wuxi 214121, China
[1]guo4480peice@163.com,[2]ri17debao@163.com

Corresponding author: Kangkang Cheng, Kk19850855@163.com

Abstract. This study employs CAD tools to visualize and analyze data related to land transfer dynamics, agricultural productivity, and consumption behaviors among farming households. By integrating HCI principles, we enhance user engagement with the data, allowing for interactive exploration of consumption trends and their correlation with land transfer decisions. Moreover, using a cosine wave as the carrier to modulate the baseband signal is called analog modulation, and using the digital pulse as the carrier to modulate the digital baseband model is called digital modulation. In addition, the analog modulation signal is a communication signal whose time value is continuous, and the digital modulation signal is a communication signal whose time value is discrete. Through experimental research, it is verified that the communication big data technology proposed in this paper can play a specific role in the analysis of the correlation between land transfer and household consumption, and several suggestions are put forward in combination with the actual situation.

Keywords: big data; land transfer; farmers; Human-Computer Interaction; household consumption; CAD Technology
DOI: https://doi.org/10.14733/cadaps.2025.S6.102-113

1 INTRODUCTION

Land is the most basic means of production and the most valuable strategic resource for agricultural production. With the increase in the proportion of rural labor force going out, the hollowing out of rural areas, and the acceleration of new-type urbanization, land transfer as an effective way to improve rural land production efficiency and achieve an appropriate scale of agricultural operation, has gradually expanded its transfer scale. At present, the land transfer rate in China has reached

31.40%. Whether the land transfer is in or out, it can increase farmers' income to a certain extent, which has reached a consensus in academic circles.

The land transfer system has the features of improving the welfare level of farmers. Still, the welfare effect significantly differs between the transfer-out and transfer-in households. Regarding objective welfare, the literature [18] analyzed the relevant situation of land transfer and found that the growth rate of per capita income of the transferring households was higher than that of the transferring households. The field survey results of literature [2] found that compared with the inflow of farmland, the outflow of farmland has a lower promotion effect on non-agricultural income, which confirms that the welfare effect of land transfer has regional differences. The literature [13] analyzes explicitly the positive impact of land transfer. The results show that the increase in cultivated land area, the improvement of agricultural technology level, and the growth of intermediate input are the reasons for the rise in the income of the land-transferring households.

In contrast, the increase in non-agricultural income and land rent are the income sources of the transferring-out households. Some scholars have also discussed the impact of land transfer on micro-farmers from the consumption perspective. The literature [16] used CFPS 2012 to analyze the data on the effects of land transfer on household consumption. It believes land transfer has an evident heterogeneous impact on the consumption of different types of farmers' households and is complementary to social security. The literature [14] introduced the perspective of social capital. Research has shown that land transfer significantly impacts the adjustment of farmers' necessary capital and livelihood strategies and can promote improving farmers' consumption levels.

Under the optimization and adjustment of land production factors, household economic income and savings changes will directly affect household consumption. First, land transfer can increase the asset income of farmers' households, thereby increasing household consumption. This is the most direct effect. As the physical capital of farmers, land can be transferred out to obtain land rental income directly, thereby increasing household consumption through the wealth effect. Secondly, land transfer can promote non-agricultural employment, increase the non-agricultural income of peasant households, and then increase household consumption. After farmers transfer their land, they will release the surplus labor force of the family, increase the non-agricultural employment ratio of family members, and then increase the non-agricultural income, ultimately affecting household consumption indirectly. Finally, land transfer can increase household savings and reduce expected risks, affecting current consumption. Not all of the increase in household income is transferred to household consumption, some of which will go to household savings. With the increase in household savings level, farmers' ability to resist risks increases, which will also cause changes in consumption levels [7]. This study uses big data and Human-Computer Interaction (HCI) methodologies to investigate land transfer's influence on farmer household consumption. HCI will be essential in gathering, processing, and visualizing large amounts of land tenure and household consumption data. The project will also use e-commerce data to investigate the relationship between land tenure security and involvement in online agricultural markets. E-commerce platforms provide valuable insights into how secure land tenure influences farmers' participation in digital marketplaces. At the same time, HCI ensures that the data collected is effectively managed and presented to facilitate comprehensive analysis. The transfer of land can play a role in both the physical capital and the spiritual capital of farmers. First, the land transfer can increase the input of farmers' land production materials and the family's operating income. Land transfer further satisfies the land use needs of agricultural operating farmers, promotes large-scale land management, and improves land production efficiency[8], thereby increasing agricultural income. Second, land transfer can help ease the financing constraints for farmers to expand production, thereby increasing household consumption. Poor financial lending is an important factor restricting the consumption of rural households [1]. Land can be used as collateral for credit collateral. Finally, land transfer can strengthen farmers' risk appetite, increasing household consumption. As an essential means of

production, land transfer can increase farmers' confidence in agricultural operations or entrepreneurship, increase expected economic returns, and stimulate household consumption[10].

Existing studies have found that the family life cycle, urban area, and income level are the key factors affecting the consumption of rural households. The number of children in the family positively impacts household food consumption, and the living consumption of young and middle-aged families is significantly higher than that of middle-aged and elderly families [15]. There is a big difference in the consumption level of farmers in different regions. The reason is that the price level of the central and eastern regions is relatively high, and the economic market in the western region is developing slowly. The household consumption of farmers in the east and central areas of China is significantly higher than that in the western regions. The impact of land transfer on household consumption is heterogeneous in the family life cycle, region, and income level. After the land transfer increases asset income, due to the increased consumption demand of family members, the impact of the wealth effect is more significant for rural households in the development period and the burden period [17].

In the long run, promoting land transfer is critical to ensure food security, promote moderate-scale operation, and realize agricultural modernization. Still, it also helps to promote the optimal allocation of labor resources among industries and increase farmers' consumption [5]. Specifically, land transfer has the effect of leveling marginal output and transaction income, which not only helps farmers to reasonably adjust the scale of land management according to their endowments, improves agricultural production efficiency by optimizing resource allocation, but also promotes farmers' income, which in turn affects household consumption. It is of great significance to increase farmers' income through land transfer and increase the consumption of farmers to expand domestic demand [4]. Many scholars have studied land transfer's economic and social impact, such as increasing farmers' income and affecting the income gap between urban and rural areas, increasing farmers' willingness to participate in higher education, promoting the development of rural financial markets, etc. However, there are few studies on the impact of land transfer on farmers' consumption [3].

The consumption behavior of farmers is the production and consumption activities engaged in by rural households as the primary economic decision-making unit to meet current and future consumption needs [12]. Given the factors influencing farmers' consumption behavior, scholars have mainly conducted research from two dimensions. One is to deepen the impact of income and uncertainty on consumption behavior from a macro perspective based on the consumption function theory. In rural areas, affected by factors such as the weak nature of the agricultural industry and population growth, the effect of improving consumption by raising income is insignificant. Factors such as the imperfect system lead to more significant uncertainty in the process of decision-making regarding consumption by rural households. Therefore, rural households have a strong "precautionary saving" motivation for consumption and a low consumption tendency [19].

Land circulation has an essential influence on farmers' consumption behavior. It can not only influence the consumption pattern but also encourage households to choose differentiated consumption items; it can also influence consumption purposes and encourage families to express heterogeneous consumption needs. The influence mechanism of land transfer on farmers' consumption behavior can be summarized into two types: one is the primary body differentiation mechanism caused by land transfer. Land transfer is an important measure to promote the optimal allocation of land resources among farmers. Along with the changes in household land resources, the proportion structure among pure farmers, part-time farmers, and non-farmers in rural areas has changed dramatically. This differentiation among the subjects will significantly impact the income distribution of farmers' households.

On the one hand, the differentiation of the subjects means that the income structure of farmers is diversified, and the resource endowments of households with different market participation

capabilities are in the agricultural and non-agricultural markets. There are differences in allocation efficiency, and households more sensitive to resource prices can obtain more wealth, thereby improving household consumption behavior [6]. On the other hand, the adjustment of the proportion of household agricultural income and non-agricultural income brought about by the differentiation of the main body. It will inevitably lead to significant differences in the stability and predictability of different components of the total household income, further affecting income expectations. Thereby changing the consumption decision [11]. The second is the consumption stratification mechanism induced by land transfer. The transfer and transfer of land will have the most significant impact on the family's production and operation, resulting in a considerable differentiation of the family's consumption structure in terms of production and living.

On the one hand, due to decreased cultivated land resources, farmer households who transfer land will inevitably reduce agricultural productive consumption expenditures. Under the condition that other factors remain unchanged, household consumption demand will face fewer constraints; on the other hand, land transfer for farmers will require more capital investment in the agricultural industry. In the short term, the overall income is unchanged. Adjusting the proportion of living consumption reasonably is an inevitable choice [9].

This paper combines big data technology to analyze the impact of land transfer on farmers' household consumption and provides a theoretical reference for improving farmers' lives.

2 ANALYSIS OF FARM HOUSEHOLD CONSUMPTION DATA BASED ON COMMUNICATION BIG DATA

The debugging method of changing some parameter features of the carrier according to the changing law of the baseband signal is called carrier modulation. Different carriers are selected, and the signal modulation methods are also different. Understanding carrier modulation techniques is crucial for optimizing communication systems in E-commerce and Human-Computer Interaction (HCI). HCI principles can guide the design of user interfaces for configuring carrier parameters, ensuring that users can interact seamlessly with modulation settings. Additionally, e-commerce platforms may utilize carrier modulation techniques for efficient data transmission, highlighting the importance of HCI in facilitating user-friendly configurations within such systems. Therefore, modulating the baseband signal with a cosine wave as a carrier is called analog modulation, and modulating a digital baseband model with a digital pulse as a carrier is called digital modulation. The research object of this thesis is digital communication signals. The following mainly analyzes the instantaneous features of digital modulation signals.

Taking the unipolar digital signal $m\ t$ as an example, if the values of the baseband signal are set to 0 and 1, the functional expression of the binary baseband signal sequence $m\ t$ is:

$$m\ t\ = \sum\nolimits_{n} a_n g\ t - nT_s \tag{1}$$

Among them, $a_n \in\ 0,1$, and the probability of taking a value of 0 is P, and the probability of empty f taking a value of 1 is 1-P, and the function expression is shown in formula 2.

$$a_n = \begin{cases} 1, 1-p \\ 0, p \end{cases} \tag{2}$$

In formula 1, T_s is the symbol interval of the binary baseband signal, g(t) represents a rectangular pulse with duration T_s, and the functional expression of g(t) is:

$$g\ t\ = \begin{cases} 1, 0 \le t \le T_s \\ 0, Others \end{cases} \tag{3}$$

The time domain expression of the 2ASK signal is:

$$x\ t\ = m\ t\ \cos\ 2\pi f_c t \tag{4}$$

$$G\ f\ = \frac{A^2}{16}\left[\frac{\sin^2\pi\ f - f_c\ T_s}{\pi^2\ f - f_c\ ^2 T_s} + \frac{\sin^2\pi\ f + f_c\ T_s}{\pi^2\ f + f_c\ ^2 T_s}\right] + \frac{A^2}{16}\left[\delta\ f - f_c\ + \delta\ f + f_c\ \right] \tag{5}$$

The complex envelope is m(t), and the instantaneous amplitude a(t) and instantaneous phase $\varphi\ t$ of the 2ASK signal are respectively:

$$\begin{cases} a\ t\ = \left| m\ t\ \right| \\ \varphi\ t\ = 0 \end{cases} \tag{6}$$

It can be seen from the analysis of the instantaneous features of the signal that the envelope of the 2ASK signal is non-constant, and its instantaneous amplitude is a time-varying function that changes with time. The instantaneous features of the 2ASK signal are shown in Figure 1.

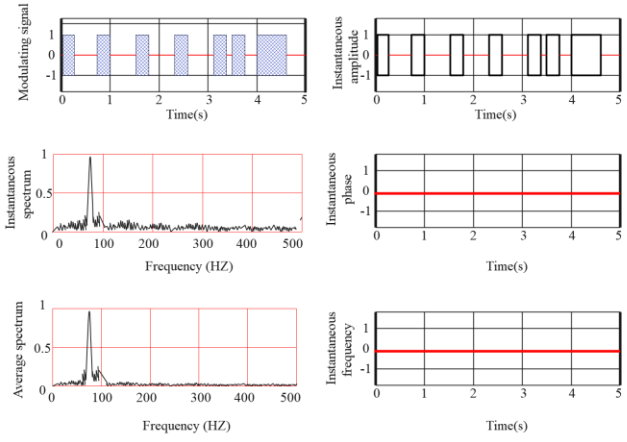


Figure 1: Simulation diagram of instantaneous features of 2ASK signal.

Phase shift keying modulates the phase of the carrier wave to make it change under the influence of the baseband signal. The functional expression of the digital baseband signal m(t) is:

$$m\ t\ = \sum\nolimits_{n} a_n g\ t - nT_s \tag{7}$$

Among them, $a_n \in$ {-1, 1}, and the probability that a_n takes a value of -1 is P, and the likelihood that g takes a 1 is 1-P. The time domain expression of the 2PSK signal is:

$$x\ t\ = \cos\ 2\pi f_c t + D_p m\ t \tag{8}$$

$_{Fc}$ is the carrier frequency, and D_p is the phase modulation factor. When the values 1 and -1 of the binary sequence a ppear with equal probability, the power spectral density of the signal is:

$$G\ f\ = \frac{A^2}{4}\left[\frac{\sin^2 \pi\ f - f_c\ T_s}{\pi^2\ f - f_c\ ^2 T_s} + \frac{\sin^2 \pi\ f + f_c\ T_s}{\pi^2\ f + f_c\ ^2 T_s}\right] \tag{9}$$

Only sideband components are in the signal spectrum, and no carrier components are included. The instantaneous amplitude a(t) and instantaneous phase $\varphi\ t$ of the phase keying signal 2PSK are, respectively:

$$\begin{cases} a\ t\ = 1 \\ \varphi\ t\ = \begin{cases} -\dfrac{\pi}{2}, m\ t\ = -1 \\ \dfrac{\pi}{2}, m\ t\ = 1 \end{cases} \end{cases} \tag{10}$$

The initial phase of the symbol is related to the information code. If D_p = π/2, the initial phase is $\pm\frac{\pi}{2}$. The instantaneous features of the 2PSK signal are shown in Figure 2.

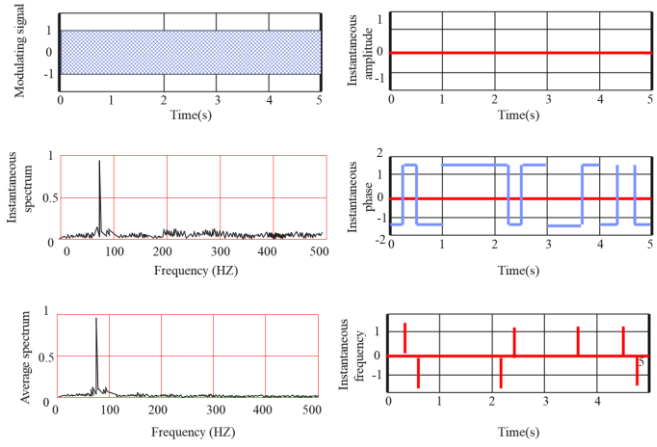


Figure 2: Instantaneous features of 2PSK signal.

Taking the bipolar digital signal m(t) as an example, the time domain expression is shown in Formula 1. If the signal carrier frequencies are set to be f_1 and f_2, Respectively, the time domain expression of the 2FSK signal is:

$$x\ t\ = m\ t\ cos\ 2pf_1t\ + \overset{n}{m}\ t\ cos\ 2pf_2t \tag{11}$$

It can be known from Equation 11 that the 2FSK signal can be regarded as the superposition of two 2ASK signals. m(t) can be expressed as:

$$\overset{n}{m}\ t\ = \mathring{a}_n \overset{n}{a}_n g\ t - nT_s \tag{12}$$

Among them, $a_n \in \{0,1\}$ and g $\overset{n}{a}_n$ is the one's complement of a_n. When the value of the binary a_n is an equal probability sequence, the power spectral density is:

$$\left.\begin{aligned} G\ f\ &= \frac{A^2}{16}\left[\frac{\sin^2\pi\ f-f_1\ T_s}{\pi^2\ f-f_1\ ^2T_s}+\frac{\sin^2\pi\ f+f_1\ T_s}{\pi^2\ f+f_1\ ^2T_s}\right] \\ &+\frac{A^2}{16}\left[\delta\ f-f_1\ +\delta\ f+f_1\ \right] \\ &=\frac{A^2}{16}\left[\frac{\sin^2\pi\ f-f_2\ T_s}{\pi^2\ f-f_2\ ^2T_s}+\frac{\sin^2\pi\ f+f_2\ T_s}{\pi^2\ f+f_2\ ^2T_s}\right] \\ &+\frac{A^2}{16}\left[\delta\ f-f_2\ +\delta\ f+f_2\ \right] \end{aligned}\right\} \tag{13}$$

It can be seen that the spectrum of the frequency shift keying signal 2FSK contains both the carrier component and the two upper and lower sideband components, which is equivalent to the superposition of the spectrum of the two 2ASK signals. The functional expressions of the instantaneous amplitude a(t) and the instantaneous phase $\varphi\ t$ of the signal are:

$$\begin{cases} a\ t\ = \left|m\ t\ \right| = 1 \\ \varphi\ t\ = \int_{-\infty}^{t} m\ \tau\ d\tau \end{cases} \tag{14}$$

The two carrier frequencies are f_1 and f_2. Respectively, the transmission frequency of the signal is related to the information code, and the initial phase is 0. The instantaneous features of the 2FSK signal are shown in Figure 3. Quadrature amplitude modulation is a method of modulating two mutually orthogonal co-frequency carriers with two baseband signals, respectively, and combining the two modulated signals (2ASK and 2PSK) into one channel, also known as an amplitude-phase joint keying signal. Among them, the two baseband signals are independent of each other. Taking the bipolar digital signal m(t) as an example, its function expression is:

$$m\ t\ = \sum\nolimits_n a_n g\ t - nT_s \tag{15}$$

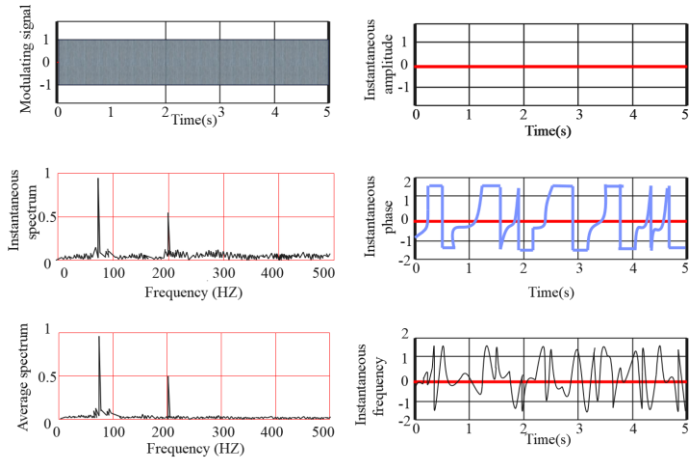


Figure 3: Simulation diagram of instantaneous features of 2FSK signal.

The in-phase component is:

$$I\ t\ = m\ t\ \cos\varphi_n \tag{16}$$

The quadrature component is:

$$Q\ t\ = -m\ t\ \sin\varphi_n \tag{17}$$

The time domain expression of the QAM signal is:

$$\left.\begin{aligned} x\ t\ &= I\ t\ \cos\ 2\pi f_c t\ - Q\ t\ \cos\ 2\pi f_c t \\ &= \sum\nolimits_n a_n g\ t - nT_s\ \cos\ 2\pi f_c t\ - \sum\nolimits_n b_n g\ t - nT_s\ \sin\ 2\pi f_c t \end{aligned}\right\} \tag{18}$$

In formula 18, the values of a_n and b_n are ±1, ±3, and ± $\sqrt{M}-1$, respectively. When M=16, a_n and b_n = ±1, ±3. The instantaneous features of 16QAM signals are shown in Figure 4.

The 16th-order QAM signal uses M constellation punctuations to represent different states, displayed on the time-domain waveform, which has three amplitudes and 12 phases. The shape of the QAM signal's power spectrum is similar to that of the PSK signal. However, the signal envelope changes while the carrier frequency is constant, and the initial phase of the symbol has nothing to do with the information code.

3 RESEARCH ON THE IMPACT OF LAND TRANSFER ON FARMER HOUSEHOLD CONSUMPTION BASED ON BIG DATA TECHNOLOGY

Combined with the algorithm in Part 2, the nearest neighbor matching (k = 4) tests the matching effect. Figure 5 shows that most observations are within the standard value range, indicating high sample quality after matching. Figure 6 reports the kernel density map after land transfer out is matched with land transfer in.

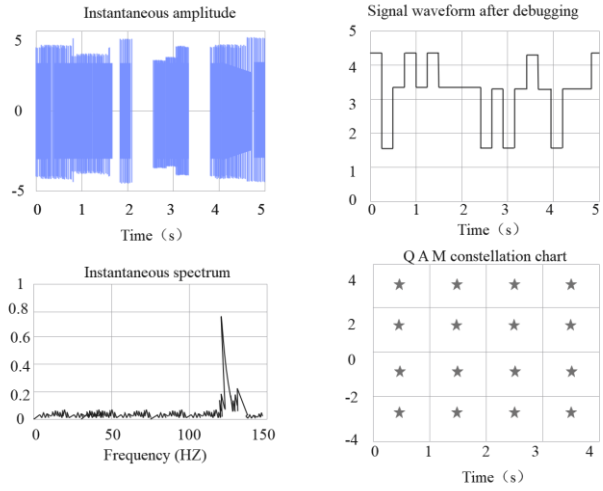
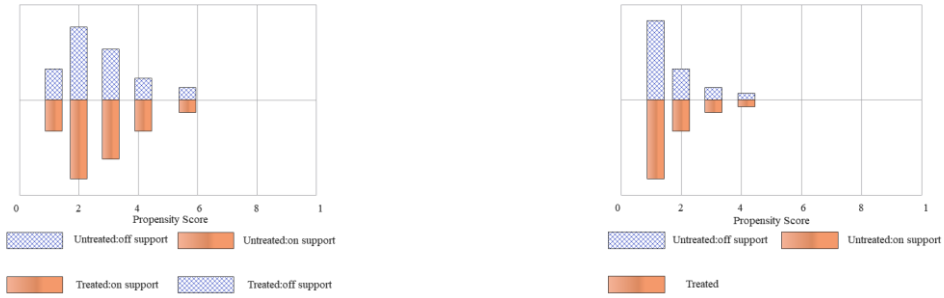


Figure 4: Simulation diagram of instantaneous features of 16QAM signal.



(a) Common value range of land transfer samples (b) Common value range of land transfer samples

Figure 5: Statistical diagram of observations.

(a) Kernel density map after land transfer outmatching (b) Kernel density map after land transfer matching

Figure 6: Kernel density map.

Based on the above research, the following recommendations are made.

It is essential to clarify land property rights, stabilize farmers' land contract rights, activate land management rights, continuously improve the rural land transfer system, and enhance land transfer efficiency. In the context of E-commerce and Human-Computer Interaction (HCI), this involves developing user-friendly digital platforms for managing land contracts and facilitating online land transfer processes. Integrating e-commerce functionalities streamlines transactions, benefiting both farmers and land administrators. At the same time, it is necessary to promote the scale of land transfer, especially the transfer of land, cultivate a market for the transfer of rural land management rights, and meet the land use needs of new business entities to start businesses. Moreover, it is necessary to improve the relevant policies and regulations on land transfer and further standardize land contractual management rights transfer procedures. Finally, it is required to actively explore a variety of land transfer modes and encourage farmers to conduct land transfer in various ways through the platform.

Secondly, it is necessary to strengthen the supervision of the land transfer market, fully grasp the inherent laws of land transfer prices, improve the compensation mechanism for farmland management, increase the encouragement and subsidies for land transfer, standardize the procedures for land transfer, and safeguard the land rights and interests of farmers. Moreover, it is necessary to continuously optimize the policy design of the reform of farmland management proper transfer and promote its effective connection with the farmer's entrepreneurship support policy. At the same time, it is necessary to encourage and support the transfer of land to large-scale households, form the spillover effect of economies of scale, release more surplus labor in rural areas, create non-agricultural employment opportunities, increase the enthusiasm of farmers to participate in land transfer, give full play to the entrepreneurial effect of land transfer, and optimize the rural employment structure. In addition, it is necessary to use new media platforms such as radio, TV, Douyin, etc., to publicize the entrepreneurial role models around you, share the entrepreneurial experience of prosperous farmers, strengthen public opinion guidance for farmers' business, let farmers establish entrepreneurial awareness, and change the traditional backwardness. Idea concept. Finally, it is necessary to carry out regular training on farmers' technical knowledge to improve their adaptability to the market environment and meet the needs of employment, entrepreneurship, and society after land transfer.

Third, differentiated land transfer policies for different farmers should be formulated, the publicity of land transfer policies should be increased, young and highly educated farmers should be encouraged to carry out land transfer actively, and they should be encouraged to start businesses. At the same time, it is necessary to fundamentally solve the worries of farmers through the establishment of a sound rural social security system so that farmers can gain a sense of security, reduce the dependence of old farmers on the land, improve their ability to adapt to market risks and accelerate the transfer of rural land.

Fourth, in promoting land transfer, the government must simultaneously improve the social security level of farmers and grasp the priorities of policies. However, economically developed regions have relatively more non-agricultural employment opportunities and higher social security levels, and farmers' willingness and recognition for land transfer is relatively more robust, which is conducive to farmers' reasonable adjustment of land management scale according to their endowments. Therefore, the government can implement a relatively loose land transfer policy, improve agricultural production efficiency by optimizing resource allocation, and promote increasing farmers' income, thereby increasing household consumption. In addition, attention should be paid to protecting the interests of farmers in land transfer, allowing farmers to participate in determining the cost of land transfer and increasing farmers' income from land transfer, thereby increasing farmers' consumption.

In general, land transfer helps to promote household consumption. Therefore, it is necessary to synergistically encourage the transfer of land in combination with the level of rural migrant workers and social security, and it will take time to solve the stagnation of domestic land transfer and the

phenomenon of farmers' concurrent employment. Specifically, the experience of agricultural production cooperatives in Japan and Korea can be used to organize farmers based on voluntary consultation. Moreover, we can start from the reality of acquaintance society, social network and capital, and village community governance and explore large-scale service methods such as production cooperation and land trusteeship that align with agricultural reality. At the same time, we can introduce modern rustic elements such as agricultural machinery, new crop varieties, and credit funds. In addition, according to the differences in regional features, resource endowments, development stages, crop varieties, and farmers' wishes, we can gradually promote land circulation and gradually unify cultivation and management, thereby reducing the agricultural production cost of fragmented cultivated land.

Fifth, the government should vigorously reform the income distribution system to increase farmers' income. In particular, it is necessary to focus on promoting rural households in economically underdeveloped areas such as the old, young, borders, and poverty to get rid of poverty and become rich, to develop individual and private economies with comparative advantages according to local conditions, to increase farmers' operating income, narrow the income gap between urban and rural areas, and promote farmers' consumption.

4 CONCLUSIONS

Due to the separation of urban and rural household registration systems, the level of social security between urban and rural areas is very different, and the urbanization process of migrant workers is relatively slow. Therefore, to promote land transfer, it is necessary to focus on priorities, adjust measures according to local conditions, and pay attention to controlling the pace to avoid harming the interests of farmers. At the same time, as the primary production and operation units in rural areas, farmers must formulate and evaluate policies from the perspective of the entire farmer family, which can help to develop policies that adapt to the features and needs of different farmers and improve the level of social security for farmers. This paper combines big data technology to analyze the impact of land transfer on farmers' household consumption. Through experimental research, it is verified that the communication big data technology proposed in this paper can play a specific role in the analysis of the correlation between land transfer and household consumption, and several suggestions are put forward in combination with the actual situation.

Kangkang Cheng, https://orcid.org/0009-0008-9149-7636
S. M. Ferdous Azam, https://orcid.org/0009-0005-7978-8324
Ali Khatibi, https://orcid.org/0009-0005-7337-9335

REFERENCES

[1] Acheampong, P. P.; Owusu, V.; Nurah, G.: How does Farmer Preference Matter in Crop Variety Adoption? The Case of Improved Cassava Varieties' Adoption in Ghana, Open Agriculture, 3(1), 2018, 466-477. https://doi.org/10.1515/opag-2018-0052

[2] Achmad, B.; & Diniyati, D.: Consumption Behavior of Farmer Households in Rural Sumbawa, Indonesia, Indonesian Journal of Forestry Research, 5(1), 2018, 69-80. https://doi.org/10.20886/ijfr.2018.5.1.69-80

[3] Arief, S.; Kusmaningtyas, A.: Faktor-Faktor Yang Memengaruhi Pola KonsumsiPanganRumahTangga, Civic-Culture: JurnalIlmu Pendidikan PKN dan SosialBudaya, 5(1), 2021, 449-459.

[4] Aryal, J. P.; Sapkota, T. B.; Rahut, D. B.; Krupnik, T. J.; Shahrin, S.; Jat, M. L.; Stirling, C. M.: Major Climate Risks and Adaptation Strategies of Smallholder Farmers in Coastal Bangladesh, Environmental Management, 66(1), 2020, 105-120. https://doi.org/10.1007/s00267-020-01291-8

[5] Bisht, I. S.; Mehta, P. S.; Negi, K. S.; Verma, S. K.; Tyagi, R. K.; Garkoti, S. C.: Farmers' Rights, Local Food Systems, and Sustainable Household Dietary Diversification: A Case of Uttarakhand Himalaya in North-Western India, Agroecology and sustainable food systems, 42(1), 2018, 77-113. https://doi.org/10.1080/21683565.2017.1363118
[6] Daihawe, D. L.; Lambert, D. M.; Mulungu, K.; Eash, N. S.: Conservation Agriculture's Effect on Smallholder Farmer Wellbeing in Mozambique, Renewable Agriculture and Food Systems, 37(2), 2022, 155-165. https://doi.org/10.1017/S1742170521000430
[7] Dessalegn, B.: Transitory Coping Strategies of Food-Insecure Smallholder Farmer Households: The Case of Ilu Gelan District, West Shoa Zone, Oromia Reginal State, Ethiopia, Agriculture & Food Security, 7(1), 2018, 1-11. https://doi.org/10.1186/s40066-018-0204-2
[8] Kaur, B.: Farm Business Income and Net Household Income of Farmer Households in Punjab-A Comparative Study, Indian Journal of Economics and Development, 16(2s), 2020, 58-67.https://doi.org/10.35716/ijed/NS20-097
[9] Lee, Y. N.: Does Aversion to Price Risk Drive Migration? Evidence from Rural Ethiopia, American Journal of Agricultural Economics, 103(4), 2021, 1268-1293. https://doi.org/10.1111/ajae.12199
[10] McLean, R. M.; Farmer, V. L.; Nettleton, A.; Cameron, C. M.; Cook, N. R.; Woodward, M.: TRUE Consortium (in International Consortium for Quality Research on Dietary Sodium/Salt). Twenty-Four–Hour Diet Recall and Diet Records Compared with 24-hour Urinary Excretion to Predict an Individual's Sodium Consumption: A Systematic Review, The Journal of Clinical Hypertension, 20(10), 2018, 1360-1376. https://doi.org/10.1111/jch.13391
[11] Mdletshe, Z. M.; Ndlela, S. Z.; Nsahlai, I. V.; Chimonyo, M.: Farmer Perceptions on Factors Influencing Water Scarcity for Goats in Resource-Limited Communal Farming Environments, Tropical Animal Health and Production, 50(7), 2018, 1617-1623. https://doi.org/10.1007/s11250-018-1603-x
[12] Mwale, M. L.; Kamninga, T. M.; Cassim, L.: The Effects of the Malawi Farm Input Subsidy Program on Household Per-Capita Consumption Convergence, Development in Practice, 32(3), 2022, 336-348. https://doi.org/10.1080/09614524.2021.1937552
[13] Purwanti, P.; Susilo, E.; Indrayani, E.: Business Empowerment Program and Household Economic Welfare: Lesson from Indonesia, The Journal of Asian Finance, Economics and Business, 7(1), 2020, 313-320. https://doi.org/10.13106/jafeb.2020.vol7.no1.313
[14] Rahayu, H. S.; Muchtar, M.; Saidah, S.: The Feasibility and Farmer Perception of True Shallot Seed Technology in Sigi District, Central Sulawesi, Indonesia, Asian Journal of Agriculture, 3(01), 2019, 16-21. https://doi.org/10.13057/asianjagric/g03103
[15] Si, C. H. E. N.; Luo, E. G.; Alita, L.; Xiao, H. A. N.; Nie, F. Y.: Impacts of Formal Credit on Rural Household Income: Evidence from Deprived Areas in Western China, Journal of Integrative Agriculture, 20(4), 2021, 927-942. https://doi.org/10.1016/S2095-3119(20)63484-0
[16] Singh, S.; Jones, A. D.; DeFries, R. S.; Jain, M.: The Association Between Crop and Income Diversity and Farmer Intra-Household Dietary Diversity in India, Food Security, 12(2), 2020, 369-390. https://doi.org/10.1007/s12571-020-01012-3
[17] Sri, J.: Poverty Level of Farmers Based on Total Income and Feasibility of Rice Farming, World Journal of Advanced Research and Reviews, 4(2), 2019, 082-089. https://doi.org/10.30574/wjarr.2019.4.2.0094
[18] Thamrin, M.; Siantara, D. P.; HRP, L. F. A.: Cow Farmer Household Consumption Pattern, JASc (Journal of Agribusiness Sciences), 4(1), 2021, 36-42.
[19] Usman, M. A.; Callo-Concha, D.: Does Market Access Improve Dietary Diversity and Food Security? Evidence from Southwestern Ethiopian Smallholder Coffee Producers, Agricultural and Food Economics, 9(1), 2021, 1-21. https://doi.org/10.1186/s40100-021-00190-8