

Research on the Correlation between "Digital Literacy" and "New Poverty" Risk of Farmers in Frontier Minority Areas

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Abstract: Under the background of comprehensively promoting rural revitalization and the construction of digital China, the frontier ethnic minority areas are facing the risk of "new poverty" caused by the "digital divide" due to the special regional conditions such as geography, economy and culture. Based on theoretical analysis and abandoning traditional empirical quantification, this study systematically analyzes the deep internal relationship between the digital literacy of farmers in frontier minority areas and the risk of new poverty. It is found that farmers have significant practical difficulties in digital access, skill application and information identification, which leads to income exclusion in the economic dimension, relationship isolation in the social dimension, identity marginalization in the cultural dimension, and relative deprivation in the psychological dimension. This multi-dimensional social exclusion further evolves into the interactive evolution characteristics of vulnerability accumulation, intergenerational transmission of disadvantage and social diffusion of risk. Therefore, it is necessary to comprehensively enhance farmers' digital literacy from the level of administrative management and social collaborative governance by consolidating digital infrastructure, building digital cultivation system, improving social support network and optimizing policy collaborative governance, so as to effectively block new poverty risks and help achieve high-quality common prosperity.

Keywords: Frontier Minority Areas; Digital Literacy; New Poverty Risks; Social Exclusion; Rural Revitalization

1. Introduction

With the rapid development of the digital economy, digital transformation has become the core driving force for rural revitalization. However, in remote and economically underdeveloped frontier minority areas, due to their geographical remoteness, relatively weak economy, and cultural diversity, they still face deep-seated challenges in digital infrastructure and technology application [1]. After the comprehensive victory in the poverty alleviation campaign and the elimination of absolute poverty, China's anti-poverty work has entered a new stage of preventing relative poverty. At this time, a new poverty risk caused by the "digital divide" is gradually emerging [2]. This new poverty manifests as social exclusion, loss of opportunities, and even cultural identity marginalization due to information restrictions and lack of skills. Farmers in frontier minority areas, as a relatively vulnerable group, the level of their "digital literacy" directly determines whether they can cross the digital divide and share the digital dividends [3]. Currently, due to educational level and language barriers, some farmers, lacking digital literacy, face the danger of being marginalized in the digital wave [4]. This trend of transformation from the "digital divide" to the "wealth divide" and "social divide" not only exacerbates regional imbalance but also poses a threat to frontier social governance and ethnic group structure. Therefore, exploring the correlation between the digital literacy of farmers in frontier minority areas and the risk of new poverty becomes an urgent issue to be addressed. Based on theoretical analysis, this study abandoned empirical quantification, and analyzed the deep interaction between the perspective of logical deduction and mechanism deduction. The research follows the main line of "concept definition-reality inspection-mechanism analysis-evolution regulation-path

construction". It starts from the concept connotation and analyzes the real digital dilemma of farmers combined with the special situation of frontier. To reveal the internal mechanism and evolution law of the new poverty risk caused by the lack of digital literacy in economy, society, culture and psychology. Finally, based on the high level of administrative management, the system path of blocking risks is proposed. This has deepened the understanding of the formation logic of "new poverty" in theory, and provided a scientific reference for relevant administrative departments to optimize decision-making and help prevent large-scale poverty return in practice.

2. Core Concepts and Theoretical Basis

2.1 Connotation of Digital Literacy

Digital literacy was initially proposed by Eshet-Alkalai, referring to the ability to acquire, understand, evaluate and create information in a digital environment [5, 6]. In the specific context of frontier minority areas, the connotation of farmers' digital literacy should not be limited to basic operational skills for hardware devices such as smart phones and computers, but should be endowed with richer multi-dimensional meanings. Specifically, it encompasses four core levels. First, "digital access literacy", which refers to overcoming geographical and economic barriers to obtain and use digital terminals and network services [7]. Second, "digital information literacy", which means overcoming the barrier of language conversion between minority languages and the national common language, and the ability to accurately search, identify and filter effective online information [8]. Third, "digital application literacy", which refers to the practical ability to use digital platforms for agricultural e-commerce sales, obtain agricultural technical guidance, participate in online public services and conduct daily electronic payments [9]. Fourth, "digital security literacy", which refers to the awareness and ability to prevent telecommunications fraud, protect personal privacy and avoid digital financial risks in a complex network environment [10]. These four levels are mutually progressive, jointly constituting the core feasible capabilities of farmers in frontier minority areas for survival and development in

the digital society.

2.2 Characteristics of New Poverty

New Poverty is a kind of relative poverty under the background of post-industrial society and information society. Unlike traditional absolute poverty, which is characterized by material scarcity and an absolute survival crisis, new poverty exhibits high levels of relativity, multi-dimensionality, and concealment. In the era of digital economy, the characteristics of new poverty in frontier ethnic minority areas mainly manifest in three aspects. Firstly, "opportunity deprivation", that is, due to the lack of the ability to effectively utilize digital technology, farmers are structurally excluded from the modern labor market, the modern agricultural industrial chain, and emerging economic forms, losing the opportunity for upward mobility [11]. Secondly, "network disconnection", that is, in the social interactions based on digital connectivity in modern society, the lack of digital literacy leads farmers to gradually detach from the mainstream social support network and public service system, falling into social relationship isolation [10]. Finally, "relative deprivation", that is, upon seeing that others or surrounding groups have improved their lives through digital technology, due to their inability to cross the digital divide, they experience a strong psychological loss and marginalization [12]. This new poverty not only threatens the livelihood resilience of individuals, but is also likely to be passed down across generations, forming deep structural disadvantages.

2.3 Theoretical Analysis Framework

This study is based on Amartya Sen's "capability theory" and the "social exclusion theory" in sociology, and constructs a theoretical analysis framework of "digital literacy deficiency - deprivation of capabilities - multi-dimensional social exclusion - accumulation of new poverty risks". From the perspective of capability theory, digital literacy has become a basic capability in modern society. The deficiency of digital literacy among farmers in frontier minority areas is essentially the deprivation of their basic capabilities such as obtaining information, accumulating capital, and participating in social development [13]. Once this capability deprivation occurs, it will spread in multiple dimensions through the social exclusion

mechanism: economically, it manifests as obstacles to obtaining digital dividends leading to a relative decline in income; socially and culturally, it manifests as barriers to accessing digital public services and the separation from the mainstream digital cultural circle. The solidification of social exclusion ultimately leads to systematic new poverty risks. This framework emphasizes that the generation of new poverty is not a single problem of technological backwardness, but a deep-seated institutional and structural exclusion process intertwined by technological disadvantages and the specific geographical, economic, and cultural environment of frontier minority areas. This theoretical framework provides rigorous logical support for the subsequent analysis of the internal mechanism and evolution pattern of new poverty risks.

3. The Dilemma of Farmers' Digital Literacy in Frontier Minority Areas

3.1 Hardware Weakness of the Access Device

Digital access is the physical prerequisite for the formation and effective utilization of digital literacy. Although in recent years the country has vigorously promoted the construction of rural information infrastructure through projects such as "Broadband in Rural Areas" and "Village-to-Village Connectivity", the remote and ethnic minority areas in the border regions, due to their complex geographical environment, deep terrain divisions, and scattered settlements, have extremely high costs for the construction and subsequent maintenance of network base stations, resulting in lagging broadband network coverage and quality in some remote villages. At the same time, at the device terminal level, limited by the family income level, some farmers can not afford the purchase and update cost of high-performance smart phones or computers. Even if they have smart phones, most of them are low-performance models that cannot run modern and complex digital agricultural applications or large-scale e-commerce software smoothly. This "access gap" caused by the double combination of geographical location disadvantages and weak economic foundation constitutes the first hard barrier for the improvement of farmers' digital literacy in frontier minority areas [14].

3.2 A General Lack of Applied Skills

After overcoming the physical access barriers, farmers in frontier minority areas generally face a "use gap" in the application skills of digital devices [15]. On one hand, the overall educational attainment of farmers in this region is relatively short and their cultural level is low. They often feel at a loss when facing digital software with certain operational thresholds, such as smart agriculture systems and complex financial credit apps. On the other hand, the minority language environment constitutes a special application barrier. The majority of current mainstream digital application systems and network information content are mainly in the national common language, and there are extremely few applications specifically developed for minority languages. Moreover, the existing speech recognition and machine translation technologies are not yet mature in processing minority languages. The difficulty of language conversion greatly increases the cognitive load for minority farmers in learning and using digital technologies, resulting in their digital applications mostly remaining at the low-level demand levels such as short-video entertainment and simple social interaction, and being unable to transform into high-level and productive applications such as production and operation, technology acquisition, and online learning.

3.3 Cognitive Limitations of Information Identification

In huge amounts of information of the digital age, information retrieval, screening and identification of critical ability is the core of digital literacy [16]. Because farmers in frontier minority areas have been in a relatively closed information ecology for a long time and lack systematic media literacy education, they often show cognitive limitations in the face of complex network information. Firstly, in terms of information retrieval, they often lack the ability to actively search for agricultural market dynamics, policy regulations, and wealth-boosting information, and their information acquisition channels are limited and passive. Secondly, in terms of information identification, due to the lack of immunity against false information, some farmers are prone to believing online rumors and false agricultural product advertisements, and even become victims of online telecommunications

fraud. Finally, in terms of information application, due to the lack of the ability to transform knowledge by integrating network information with the actual agricultural production, even if valuable digital information is obtained, it is difficult to convert it into actual economic benefits. This deficiency in information cognition and processing capabilities makes them highly vulnerable to falling into information cocoons in the digital society, and they face a high risk of digital security and information disorientation.

4. The Internal Mechanism of New Poverty Risk Triggered by Lack of Digital Literacy

4.1 Income Exclusion in the Economic Dimension

The essence of digital economy is the value of information and data elements. The lack of digital literacy directly blocks the path for farmers in border ethnic minority areas to convert data factors into economic benefits, thereby triggering income exclusion in the economic dimension [17]. On the production side, farmers without adequate digital literacy are unable to leverage smart agricultural technologies such as the Internet of Things and big data to achieve precision planting and scientific breeding, resulting in low agricultural production efficiency, weak risk resistance, and difficulties in reducing costs and increasing efficiency. On the circulation side, due to the lack of mastery of digital sales skills such as e-commerce platform operation and live streaming commerce, farmers cannot break the monopoly of intermediaries in traditional agricultural product sales, making it hard for characteristic agricultural products to connect with the broad external market and leading to the dilemma of "bumper harvests without corresponding profits". On the employment side, with the general improvement of digital skill requirements in the labor market, the absence of digital literacy excludes farmers from high-income positions in the platform economy and gig economy during the transfer to non-agricultural employment, confining them to low-value-added manual labor [18]. Such exclusion across the entire chain of production, circulation, and employment continuously widens the income gap between farmers lacking digital literacy and those proficient in digital skills, trapping the former in the economic mire

of relative poverty.

4.2 Relational Isolation in the Social Dimension

Social capital serves as an important buffer for farmers to resist risks and acquire resources. Digital technology is profoundly reshaping the ways in which social capital is accumulated and maintained [18]. The lack of digital literacy has led to network disconnections in social interactions for farmers in frontier minority areas, causing them to fall into social isolation in terms of relationships. On one hand, in strong relationship networks, as young laborers leave for work, the traditional village-based kinship society is gradually replaced by a "digital semi-kinship society" based on social media. Elderly people or farmers lacking digital communication skills find it difficult to maintain frequent emotional connections with their external relatives, resulting in the weakening of traditional family and clan support networks. On the other hand, in weak relationship networks, the lack of digital literacy hinders farmers from building broader industry-based and interest-based networks beyond geographical limitations. They are unable to obtain agricultural mutual assistance resources or social assistance information through online communities, industry forums, etc. This kind of online and offline social capital loss, weakened the farmers cope with emergencies, such as natural disasters, market volatility social support, make it increasingly in the social structure in a isolated vulnerable position.

4.3 Identity Marginalization in the Cultural Dimension

Cultural identity is the core of national cohesion and individual social belonging. In the digital age, the online space has become an important domain for cultural production, dissemination, and identity construction [19]. The lack of digital literacy among farmers in border minority areas not only limits their access to mainstream digital cultural products, but also exposes them to the risk of cultural marginalization in the online cultural space. Firstly, due to their inability to proficiently use digital platforms, the excellent traditional culture and intangible cultural heritage of ethnic minorities cannot be passed down and widely disseminated through digital means, resulting in

the crisis of linguistic loss of their own culture in the digital wave. Secondly, when confronted with the overwhelming modern urban culture and consumerist trends on the internet, farmers lacking the ability to critically identify digital information are prone to experiencing cultural inferiority or value confusion in cultural collisions. This state of being voiceless and passive acceptance in the digital cultural space weakens the cultural confidence of ethnic minority farmers, causing them to gradually be marginalized in the macro social cultural structure and becoming "new poor" in the cultural sense.

4.4 Relative Deprivation in the Psychological Dimension

The new poverty is not only an objective material and social condition, but also a subjective psychological experience. The lack of digital literacy is easy to give rise to a strong sense of relative deprivation among farmers in frontier minority areas [12]. With the widespread use of smartphones, even farmers with low digital literacy can directly observe the prosperous urban life, convenient digital services, and the accumulation of wealth achieved by others through the digital economy through passive viewing of short videos. However, when they attempt to participate in it, they find themselves hindered invisibly due to skill deficiencies, language barriers, or outdated equipment. This huge gap of "seeing but not reaching" disrupts the psychological balance in the traditional closed rural environment, making them deeply feel their lagging behind and being abandoned in the modernization process. Long-term psychological frustration and a sense of powerlessness can easily evolve into a rejection of digital technology or even resentment towards the solidification of social classes, further weakening their intrinsic motivation for self-development and creating a vicious psychological cycle of "lack of digital literacy - enhanced sense of relative deprivation - loss of development momentum - intensification of new poverty".

5. The Interactive Evolution of the Digital Divide and New Poverty Risks

5.1 The Cumulative Effect of Vulnerability

The lack of digital literacy does not exist in isolation; it interweaves with other dimensions

of disadvantaged characteristics, such as low income, low educational level, and remote geographical location, creating a "cumulative effect of vulnerability"[20]. This cumulative effect is particularly evident in border minority areas. The initial economic poverty leads to farmers being unable to afford the cost of digital access; the lack of digital access then limits their opportunities to obtain education, medical care, and market information, thereby hindering the improvement of their human capital and social capital; the lack of capital further weakens their competitiveness in the digital economy. This chain reaction triggered by the shortcoming of digital literacy has led to a continuous decline in the livelihood resilience of farmers when they are resisting external shocks, such as fluctuations in agricultural product prices, natural disasters or public health emergencies. With the comprehensive penetration of digital technology in various fields of society, the originally technical "digital vulnerability" gradually transforms into "systemic vulnerability" at the level of survival and development, significantly intensifying the accumulation depth of new poverty risks.

5.2 Intergenerational Inheritance of Disadvantages

In the era of the digital economy, a significant evolution characteristic of new poverty risks is the intensification of the trend of intergenerational transmission of disadvantages [21]. Digital literacy has become the core medium for the distribution of modern educational resources and the acquisition of knowledge. In rural minority areas, farmers' families with insufficient digital literacy have failed to provide their children with adequate digital learning equipment and a favorable family environment for digital tutoring, resulting in their children falling behind those from families with abundant digital resources at the initial stage. Against the backdrop of the comprehensive digitalization of basic education, this family-level digital divide directly translates into disadvantages for their children in accessing online learning resources, developing digital skills, and expanding their comprehensive qualities. When this "digital education gap" becomes entrenched over time, the offspring of poor families will struggle to gain a competitive edge in the highly digitalized labor market in the future, thus falling into a

similar or even more severe relative poverty situation, forming a new poverty risk cycle from generation to generation.

5.3 Social Transmission of Risks

The new poverty risks caused by the lack of digital literacy not only affect individuals or families, but also have a significant social spatial diffusion effect [16]. In border areas where ethnic minorities live in concentrated communities, if a large number of farmers are continuously excluded from the benefits of the digital economy for a long time, the resulting collective sense of deprivation and social alienation will gradually accumulate into potential risks for social governance. On one hand, the expansion of the new poverty group may intensify the conflicts and contradictions of interests in the grassroots society, increasing the cost and difficulty of rural governance; on the other hand, in the complex border geopolitical environment, the group marginalization caused by low digital literacy is prone to be exploited and utilized by external negative information or extremist ideas, thereby posing a hidden threat to ethnic unity and the stability of border society. Therefore, the new poverty risks caused by the digital divide are not only an economic development issue, but also a comprehensive risk that may spread to the fields of social governance and political security over time.

6. Paths to Enhancing Digital Literacy for Mitigating the Risk of New Poverty

6.1 Consolidating Digital Infrastructure

To solve the new poverty risk of farmers in frontier minority areas, the first task is to eliminate the "access gap" and consolidate the base of digital infrastructure. This requires breaking away from the limitation of solely relying on market mechanisms for network construction and enhancing the government's public service functions. On one hand, it is necessary to increase the transfer payments and special subsidies from the central and provincial governments to the "new infrastructure" such as broadband networks and 5G base stations in border and remote areas, reducing the costs of network construction and operation, and ensuring deep coverage of network signals. On the other hand, measures such as implementing the "digital devices going to the countryside" subsidy policy and jointly launching "targeted

data plan discounts" for low-income farmers can be adopted to substantially lower the economic threshold for farmers to obtain and use smart terminals, ensuring that the most vulnerable groups have access to basic digital services.

6.2 Building a Digital Talent Development System

The key to overcoming the "usage gap" lies in building a digital literacy cultivation system that suits the characteristics of ethnic minority farmers in border areas. Firstly, the training content and methods should be optimized. Rely on village-level service centers or new era civilization practice stations to carry out regular and scene-based digital skills training, and the content should be closely related to the actual production and life of farmers, such as e-commerce live broadcast of agricultural products, smart agricultural operation, and prevention of telecom fraud. Secondly, in response to the language barriers of ethnic minorities, it is necessary to encourage cooperation between technology enterprises and universities, and increase the research and development efforts of technologies for language recognition and translation in minority languages. Develop digital applications for farmers that have "bilingual conversion" or even "pure voice interaction" functions to reduce the cognitive load of farmers. Additionally, the "digital feedback" role of village officials, returning young entrepreneurs, and college students can be leveraged. Establish a "digital assistance pairing" mechanism and adopt a "teaching and guiding" model to effectively enhance the overall digital application and information identification capabilities of farmers.

6.3 Strengthening Social Support Networks

To resist new poverty risks, it is necessary to restructure farmers' social support networks in the digital age and break the isolated state of social relations. At the formal institutional level, the government should accelerate the extension of "Internet + government services" to the grassroots level, optimize the elderly-friendly and barrier-free design of online government service platforms, and ensure that farmers can equally and conveniently access digital public service resources such as medical care, education, and social security. At the

informal institutional level, efforts should be made to actively cultivate and develop rural digital social organizations, such as online agricultural professional cooperatives and rural cultural exchange communities, guiding farmers to reconstruct mutual assistance relationships online. At the same time, it is encouraged to use digital platforms such as short videos and live streaming to disseminate the excellent traditional culture of ethnic minorities, enhance farmers' participation and voice in digital culture, and provide cultural ties for their integration into the mainstream social network while strengthening cultural confidence.

6.4 Optimizing Policy Coordination and Governance

The improvement of digital literacy and the prevention of new poverty constitute a complex systematic project, which requires overall planning by the administrative management system and policy coordination. All levels of administrative departments should break through the management barriers of "sectoral division" and establish a collaborative governance mechanism involving multiple departments such as cyber information, agriculture and rural areas, rural revitalization, ethnic and religious affairs, etc. In terms of policy formulation, the improvement of farmers' digital literacy should be incorporated into the overall planning of local economic and social development and the assessment indicators system for rural revitalization, to ensure the continuity of policy implementation and the stability of resource investment. At the same time, a dynamic digital monitoring and early warning platform for new poverty risks should be established, using big data technology to accurately identify the relatively impoverished marginalized groups caused by the digital divide, and implement differentiated policies and precise assistance. By building a diversified co-governance pattern of "government leadership, market participation and social coordination," a strong joint force can be formed to block the risk of new poverty.

7. Conclusion

During the historical convergence period when both the comprehensive promotion of rural revitalization and the construction of Digital China are underway, the enhancement of digital literacy among farmers in border minority areas

not only affects their individual livelihoods and well-being, but also relates to the overall situation of regional coordinated development, social equity, and ethnic unity. This study, based on theoretical reasoning, systematically analyzed the intrinsic connection between digital literacy and the risk of new poverty. The research found that farmers in border minority areas face economic dimension income exclusion, social dimension relationship isolation, cultural dimension identity marginalization, and psychological dimension relative deprivation due to their actual difficulties in digital access, skill application, and information identification. This multi-dimensional social exclusion caused by the lack of digital literacy is accelerating into a systemic risk of new poverty and exhibits the interactive evolution characteristics of vulnerability accumulation, intergenerational transmission, and social diffusion.

Facing this severe challenge, the traditional logic of poverty alleviation has become unable to meet the new requirements of the digital age. It is necessary to view enhancing farmers' digital literacy as a key fulcrum to prevent new risks of poverty. This requires the concerted efforts of the government, the market, and various social forces: to bridge the "access gap" by laying a solid foundation for digital infrastructure; to overcome the "usage gap" by establishing a digital cultivation system that suits the characteristics of ethnic minorities; to resist "relationship isolation" by improving the online and offline social support network; and to lead the formation of a policy governance system with multi-sectoral collaboration as the framework to create a long-term mechanism. Only by fundamentally empowering the border minority farmers and comprehensively enhancing their capabilities in the digital age can we effectively prevent large-scale poverty relapse risks and ensure that all ethnic groups do not fall behind or lag behind in the digital economy wave, ultimately achieving high-quality common prosperity and long-term social stability.

Acknowledgments

This paper is supported by the Key Research Base of Humanities and Social Sciences of Universities in Guangxi Zhuang Autonomous Region "Research on the Industrial Revitalization and Development of artificial

Intelligence empowering Zuoyoujiang Old Revolutionary Base Area” (2025JDZD025).

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