Postprint: Multidimensional Poverty Measurement Indicators and Empirical Study of Science and Technology Information in China

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Abstract

[Objective/Significance] This study designs a multidimensional poverty index system for scientific and technological information in China, conducts empirical research, and formulates assistance strategies to promote the enhancement of farmers' scientific and technological information literacy and sustainable development in impoverished areas, while also providing reference methods and data for research on scientific and technological information poverty in China. [Method/Process] Centering on the overall objectives of science and technology poverty alleviation in China, integrating the scientific and technological information needs of farmers in impoverished areas, and from the perspective of libraries improving farmers'scientific and technological information literacy and the scientific and technological information capacity of impoverished regions, this study explores and constructs a multidimensional poverty measurement index system for scientific and technological information in China comprising five dimensions ("education" , "healthcare" , "industry" , "personnel" , "management") and 15 indicators. On this basis, the A-F method is employed to conduct empirical research with the Qinba Mountain Area as a case study. [Result/Conclusion] The constructed multidimensional poverty index system and measurement method for scientific and technological information in China can effectively reflect the current status of multidimensional poverty in scientific and technological information in the Qinba Mountain Area, identify its degree, distribution, and key points, effectively formulate corresponding assistance pathways and strategies, and promote the enhancement of farmers' scientific and technological information literacy and regional scientific and technological information capacity in the Qinba Mountain Area.

Full Text

Preamble

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Abstract:
[Purpose/Significance] This paper designs a multidimensional poverty indicator system for science and technology (S&T) information in China, conducts empirical research, and formulates assistance strategies. The aim is to promote the improvement of farmers' S&T information literacy and sustainable development in poverty-stricken areas, while providing reference methods and data for China' s S&T information poverty research. [Method/Process] Centered on China' s overall goals for S&T poverty alleviation and combining the S&T information needs of farmers in impoverished regions, this study explores the construction of a multidimensional S&T information poverty measurement indicator system from the perspective of libraries enhancing farmers' S&T information literacy and regional S&T information capacity. The system comprises five dimensions – "education," "medical care," "industry," "personnel," and "management" –with 15 indicators. Based on this framework, the A-F method is applied to conduct an empirical study in the Qinba Mountain region. [Result/Conclusion] The constructed indicator system and measurement method can effectively reflect the current state of multidimensional S&T information poverty in the Qinba Mountain area, revealing its extent, distribution, and key points. This enables the formulation of targeted assistance pathways and strategies to promote the improvement of farmers' S&T information literacy and regional S&T information capacity in the Qinba Mountain region.

Keywords: library; S&T information poverty; multidimensional measurement; Qinba Mountain region; assistance strategies
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1. Introduction

As China' s "targeted poverty alleviation" strategy enters its final stage, impoverished regions have successively been lifted out of poverty, and future support will gradually shift toward enhancing the endogenous drivers of sustainable development in these areas. S&T information poverty alleviation, which encompasses scientific concepts, knowledge, capabilities, and services, aims to improve farmers' S&T information literacy and skill levels while enhancing S&T information service capacities in impoverished regions. Its importance is increasingly prominent. Libraries, as crucial carriers, collectors, disseminators, and service

providers of S&T and cultural knowledge, play a significant role in S&T information poverty alleviation efforts: (1) libraries meet people' s needs for S&T knowledge and information through standardized and equitable S&T literature services while fostering a science-advocating atmosphere; (2) libraries enhance public S&T information literacy and scientific awareness through S&T dissemination services, spreading knowledge, skills, and experiences to improve learning and working capabilities; and (3) as S&T information service institutions, libraries provide multi-type S&T information consulting and services for poverty-stricken areas, including decision-making support, information intermediation, intellectual property services, and training. Therefore, library participation in S&T information poverty alleviation serves as an important supplement and extension of targeted poverty alleviation strategies and holds significant meaning for the future deepening of the "rural revitalization" strategy.

Both domestically and internationally, research on library participation in S&T information poverty alleviation has gained momentum. Internationally, the Research4Life program organized by the United Nations has brought together library and information institutions from multiple countries, including Cornell University Library and Yale University Library, to provide free or low-cost S&T information resources on health, agriculture, and environment to developing countries, supporting poverty eradication and health improvement [1]. Some developed countries' library and documentation institutions have provided remote S&T information service assistance [2] or jointly built information technology centers with local governments and non-profit organizations to improve S&T information service infrastructure in rural areas [3], offering S&T information services for agricultural development [4]. Some developing country libraries have also actively sought cooperation with international organizations to enhance access to S&T and health information or explored improving S&T information access in rural poverty-stricken areas through libraries [5].

In China, in 2001, the Ministry of Science and Technology and the United Nations Development Programme (UNDP) collaborated on the "China S&T Information Poverty Alleviation Capacity Building" project to promote the improvement of S&T information capacity and service levels in impoverished regions [6]. Subsequently, scholars proposed incorporating libraries into government-led S&T information poverty alleviation efforts [6-7]. Currently, library participation in S&T information poverty alleviation has gradually attracted academic attention, with research focusing on the significance and feasibility of library involvement [8-10], driving forces and positioning [9-12], utilization of S&T literature information services [10,13-14], paired assistance for libraries in poverty-stricken areas [15-16], and effectiveness evaluation mechanisms [17].

However, current research on library participation in S&T information poverty alleviation still has areas for improvement: (1) in terms of research scope, most studies are limited to traditional library work such as S&T literature resources and information retrieval capabilities, with few addressing diversified library functions like S&T information consulting, decision-making support, and train-

ing services; (2) in terms of research depth, studies on S&T information poverty remain at the level of general surveys using questionnaires, lacking systematic indicator systems to analyze, measure, and evaluate the S&T information poverty status of farmer populations—this represents a key challenge in current research; and (3) in terms of research design, no studies have yet matched the supply of S&T information services that libraries can provide with the potential demands of poverty-stricken areas, making it difficult to propose systematic and efficient assistance strategies.

Therefore, this paper constructs a multidimensional S&T information poverty measurement indicator system for China from the perspective of libraries enhancing S&T information capacity in poverty-stricken areas. Centered on China' s overall S&T poverty alleviation goals and requirements for farmers' information literacy, and combining specific needs in impoverished regions, this study conducts measurement and analysis of the current state of multidimensional S&T information poverty in the Qinba Mountain region as an empirical case. Based on the findings, corresponding assistance strategies are proposed to provide recommendations for promoting the improvement of farmers' S&T information literacy and sustainable development in the Qinba Mountain region, while also offering reference methods and data for China' s S&T information poverty research.

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2. Research Theory and Methods

2.1 Multidimensional Poverty Theory

Since the 1980s, the multidimensional nature of poverty has gained increasing attention. In 1981, A. Sen proposed the "capability poverty" concept [18], initiating multidimensional poverty research. Multidimensional poverty theory expands the connotation of poverty, arguing that poverty measurement should include not only economic income but also health, life expectancy, education, security, resources, social exclusion, voice, and other dimensions [19-20]. Multidimensional poverty theory has become a research hotspot, with extensive exploration in measurement methods [21-22], multidimensional poverty reduction strategies [23-24], and multidimensional poverty alleviation performance evaluation [25]. The United Nations Development Programme has constructed the Human Poverty Index (HPI) and Multidimensional Poverty Index (MPI) based on multidimensional poverty concepts, applying them in annual Human Development Reports and Global Multidimensional Poverty Index reports.

Multidimensional poverty theory can reflect the deprivation status of poverty-stricken objects across various dimensions, providing effective guidance for public policy to identify assistance focal points [26], thus holding important theoretical and practical value for China' s S&T information poverty governance. The S&T information poverty studied in this paper is a multidimensional poverty involving multiple factors, encompassing both individual-level poverty in S&T

information literacy and capabilities (e.g., S&T concepts, common knowledge) and regional-level poverty in S&T industry, market, management, and services (e.g., S&T industry information, S&T intermediation services). Therefore, this paper employs multidimensional poverty theory to explore China' s S&T information poverty and constructs a multidimensional S&T information poverty indicator system to more scientifically and effectively measure the status of S&T information poverty in China' s impoverished regions.

2.2 Multidimensional Poverty Measurement Methods

Currently, international multidimensional poverty measurement methods mainly fall into three categories: axiomatic methods, fuzzy set methods, and information theory methods, with axiomatic methods being the most widely used and recognized. Axiomatic methods are measurement approaches formed through abstract representation based on socially axiomatic information in poverty research [27]; multidimensional poverty indices or methods such as the H-M index, HPI index, Ch-M index, F-M index, W-M index, Watts method, A-F method, and MPI index are all results of the evolution of axiomatic methods [28-31]. Among them, the A-F method, also known as the "dual cutoff method," was proposed by S. Alkire and J. Foster in 2008. It comprehensively measures multidimensional poverty by constructing deprivation cutoffs and poverty cutoffs, and is a highly recognized method in axiomatic approaches [30-31].

The A-F method examines the multidimensional characteristics of poverty-stricken objects, identifying whether deprivation exists in each dimension and comprehensively calculating multidimensional poverty evaluation indices to reveal poverty status. This paper employs the A-F method to analyze the multidimensional S&T information poverty status in China' s impoverished regions based on the constructed indicator system.

Let $X = [X_{ij}]$ be an $n \times d$ matrix representing the status of n target objects across d dimensions, where X_{ij} denotes the status value of individual i in dimension j; $j = 1, 2, 3, \ldots, d$. Let $z_j (z_j > 0)$ represent the deprivation cutoff for individual target objects in dimension j, and Z be the row vector of specific dimension deprivation cutoffs. The specific steps are as follows:

(1) Determine whether target object i suffers deprivation in a given dimension through the deprivation cutoff z_j. Define the deprivation matrix $g^0 = [g^0_{ij}]$, where $g^0_{ij} = 1$ if $x_{ij} < z_j$ and 0 if $x_{ij} \geq z_j$.

(2) Determine whether an individual is in a state of multidimensional S&T information poverty through the poverty cutoff r. Let c_i be the total number of dimensions in which target object i is deprived, and w_j be the weight of dimension j. Then $c_i = \sum_{j=1}^{m} w_j g^0_{ij}$, with $0 \leq c_i \leq d$. Let $\rho_k(X_i, Z)$ be the multidimensional poverty identification function, where the poverty cutoff k satisfies $0 < k \leq d$. Then:

$$\rho_k(X_i, Z) = \begin{cases} 1, & c_i \geq r, \text{ individual } i \text{ is in multidimensional poverty} \\ 0, & c_i < r, \text{ individual } i \text{ is not in multidimensional poverty} \end{cases}$$

(3) Calculate the multidimensional S&T information poverty index. After identifying multidimensional poverty-stricken individuals, aggregate them and calculate three indicators: multidimensional poverty incidence, average deprivation share, and multidimensional poverty index. Let $C_{ij}(k)$ be the sum of poverty dimensions for target object groups in poverty status in at least k dimensions, and $q_{ij}(k)$ be the total number of multidimensional poverty-deprived individuals when the dimension cutoff is k. The indicators are calculated using formulas (1)-(3). M is the multidimensional poverty index; H is the multidimensional poverty incidence, i.e., the proportion of multidimensional poverty-stricken objects in the total population; A is the average deprivation share, i.e., the proportion of average deprived dimensions to total possible deprived dimensions for poverty-stricken objects.

$$H(k) = \frac{\sum_{i=1}^{n} q_{ij}(k)}{n}$$

$$A(k) = \frac{\sum_{i=1}^{n} C_{ij}(k)}{\sum_{i=1}^{n} q_{ij}(k) \times d}$$

$$M(k) = H(k) \times A(k)$$

(4) Calculate the contribution rate I_j of each dimension to multidimensional poverty. The contribution rate reveals the degree to which different dimensional factors contribute to multidimensional poverty, enabling the identification of key causes of S&T information poverty and the formulation of targeted assistance strategies.

$$I_j = \left(\frac{w_j}{d}\right) \times \left(\frac{H_j}{M}\right)$$

3. Indicator System Construction

3.1 Feature Dimension Design

Based on the Ministry of Science and Technology' s "Implementation Opinions on Targeted S&T Poverty Alleviation," the State Council' s "Two Assurances and Three Guarantees" for targeted poverty alleviation, and classic theories and requirements of poverty alleviation strategies, this paper extracts key

elements related to "S&T information poverty alleviation" to form the basic framework of China' s S&T information poverty system. It then identifies the specific content, levels, and capacity characteristics of S&T information assistance that three main types of libraries in China (public libraries, university libraries, and specialized libraries) can provide, matching them with the actual needs of poverty-stricken areas for library-supported S&T information poverty alleviation. Through expert consultation, a basic architecture for China' s multidimensional S&T information poverty indicator system is formed, targeting both individual and regional levels and comprising five dimensions: "education," "medical care," "industry," "personnel," and "management," as shown in [Figure 1: see original paper].

(1) **Education Dimension (S&T Information Supporting Education):** This dimension addresses potential capability deficiencies among farmers in poverty-stricken areas regarding scientific concepts, S&T awareness, and S&T knowledge and information capabilities in the educational domain.

(2) **Medical Dimension (S&T Information Supporting Medical Care):** This dimension addresses potential capability deficiencies among farmers in poverty-stricken areas regarding scientific knowledge of common diseases, standardized treatment, and the ability to scientifically understand and use advanced S&T medical facilities.

(3) **Industry Dimension (S&T Information Supporting Industry):** This dimension addresses potential capability deficiencies in poverty-stricken areas regarding S&T industry information resource support, including the construction of characteristic industry databases, S&T industry information collection, and S&T industry promotion.

(4) **Personnel Dimension (S&T Information Supporting Personnel):** This dimension addresses potential capability deficiencies in poverty-stricken areas regarding the construction of S&T expert databases, talent introduction and evaluation, and training and development of S&T innovation and entrepreneurship talents.

(5) **Management Dimension (S&T Information Supporting Management):** This dimension addresses potential capability deficiencies in poverty-stricken areas regarding S&T management mechanisms and policy research, S&T management platform construction, S&T information evaluation and decision-making services, and S&T information consulting and intermediary services.

The individual level in poverty-stricken areas focuses primarily on the education and medical dimensions, emphasizing scientific concepts, S&T knowledge, standardized disease understanding and treatment, and S&T information skills closely related to farmers' daily lives. The regional level focuses mainly on the industry, personnel, and management dimensions, emphasizing S&T industry information databases, S&T industry promotion, S&T expert databases, S&T

information services (intermediation, consulting, etc.), and S&T innovation and entrepreneurship training related to overall regional development.

3.2 Indicator System Construction

Building upon the five dimensions, this paper further employs the analytic hierarchy process to analyze each dimension and its connotations according to the principles of scientificity, completeness, innovativeness, and operability. Each dimension is extended into specific indicators, initially forming 21 indicators. Due to inevitable redundancy, complexity, gaps, and noise in the initial indicator system, as well as difficulties in obtaining some indicator data, the initial indicator system for library-supported S&T poverty alleviation in China was revised and adjusted. The final system retains 15 indicators, forming a "5 dimensions - 15 indicators" multidimensional S&T information poverty measurement system for China, as shown in .

3.3 Cutoff Values and Weight Coefficients

Based on the specific content and connotation requirements of each indicator, corresponding standards and cutoff values were designed. For example, under the education dimension, the indicator "awareness of superstitious (pseudo-scientific, ignorant) thoughts" is assigned a value of 1 if such thoughts exist, and 0 otherwise. Other indicator standards and cutoff values are shown in .

To more effectively reflect the impact of each indicator on the system, this paper assigns weight coefficients to the indicator system through expert consultation and group decision-making methods. Specifically, according to the characteristics of S&T information poverty alleviation, nine experts in S&T management, S&T policy, S&T poverty alleviation, and library science scored the importance of each indicator, and the weight coefficients were obtained through comprehensive calculation. Nine expert survey forms were distributed , and nine valid forms were returned. The resulting weight coefficients for each indicator are shown in .

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4. Empirical Research

Based on the constructed multidimensional S&T information poverty indicator system for China, this paper employs the A-F method to conduct an empirical study in the Qinba Mountain region, analyzing the current state of multidimensional S&T information poverty and designing corresponding assistance strategies.

4.1 Data Source Description

The Qinba Mountain area is a contiguous destitute region in China, spanning six provinces and municipalities (Sichuan, Shaanxi, Chongqing, Gansu, Hubei,

and Henan), including 80 counties (cities, districts), with a total area of 225,000 square kilometers and a population of approximately 38 million. Characterized by harsh natural conditions, deep economic difficulties, weak industries, and complex poverty-causing factors, the Qinba Mountain region is a major battlefield for targeted poverty alleviation and S&T poverty alleviation in China.

This study selected six counties and 18 villages in the Qinba Mountain region as representative cases: Lizhou District of Guangyuan City, Pingwu County of Mianyang City, Yilong County of Nanchong City, and Tongjiang County of Bazhong City in Sichuan Province; Yunyang County in Chongqing Municipality; and Ningqiang County of Hanzhong City in Shaanxi Province. Data collection was completed through household surveys, group discussions, and commissioned surveys, with 2,653 questionnaires distributed and 2,402 valid questionnaires returned (effective recovery rate of 90.54%). Additionally, 77 effective in-depth interview records were obtained, as shown in . The collected data basically reflects the S&T poverty status in the Qinba Mountain region.

4.2 Unidimensional Poverty Measurement and Analysis

presents the unidimensional poverty measurement and analysis results for six representative districts and counties in the Qinba Mountain region. Overall, the highest poverty incidence occurs in the personnel dimension indicator "talent introduction and evaluation reference," reaching 60.37%. The second highest is the education dimension indicator "S&T information capability," with a poverty incidence of 52.41%, followed by the industry dimension indicator "S&T industry information consulting services" at 49.42%. Additionally, four other indicators exceed 30% poverty incidence: "awareness of new S&T medical tools" in the medical dimension, "S&T information evaluation and decision-making consulting" in the management dimension, "awareness of health/sanitation and disease knowledge" in the medical dimension, and "S&T information supporting S&T intermediary services" in the management dimension, with the latter reaching 32.72%.

These results indicate that S&T information unidimensional poverty in the Qinba Mountain region primarily lies in the personnel, education, and industry dimensions. At the individual level, there is a lack of S&T information retrieval capabilities and understanding of new S&T knowledge; at the regional level, there is a shortage of professional S&T information service support.

4.3 Multidimensional Poverty Measurement and Analysis

reports the multidimensional S&T information poverty measurement results for the Qinba Mountain region. According to general standards for multidimensional poverty measurement, multidimensional poverty is identified when deprivation exists in three or more dimensions simultaneously. The results show that when $k = 3$, the overall multidimensional poverty incidence H in the Qinba Mountain region is 82.75%, meaning over 80% of the population experiences

multidimensional deprivation in S&T information. Specifically, 99.73% suffer deprivation in at least one dimension, and 93.86% suffer deprivation in at least two dimensions. The average deprivation share A is 0.3517, and the multidimensional poverty index M is 0.2910. These high values indicate that S&T information poverty is widespread in the Qinba Mountain region, requiring urgent assistance measures.

As shows, as the number of deprived dimensions k increases, the multidimensional poverty incidence H gradually declines, with the decline rate initially rapid then slowing. The average deprivation share shows a gradually increasing trend, with the increase rate initially slow then accelerating. The multidimensional poverty index first rises then falls, reaching its maximum value of 0.3514 at $k = 7$, with a corresponding multidimensional poverty incidence of 58.89% and average deprivation share of 0.5967.

When the deprivation cutoff k is between 3 and 7 ($3 \leq k \leq 7$), the multidimensional poverty index remains relatively stable or increases slightly, while the multidimensional poverty incidence remains at a high level, with over 80% experiencing deprivation in at least three dimensions and about 60% experiencing deprivation in at least seven dimensions. This range represents mild multidimensional S&T information poverty. When k is between 8 and 11 ($7 < k \leq 11$), the multidimensional poverty index declines significantly, and the multidimensional poverty incidence decreases rapidly, with about 16% experiencing deprivation in at least 11 dimensions. This range represents moderate multidimensional S&T information poverty. When k is between 12 and 15 ($11 < k \leq 15$), both the multidimensional poverty incidence and index are at low levels, representing severe multidimensional S&T information poverty.

4.4 Multidimensional Poverty Decomposition and Analysis

4.4.1 Geographic Decomposition of Multidimensional Poverty reveals that within the mild multidimensional poverty range ($3 \leq k \leq 7$), Ningqiang County in Hanzhong City, Shaanxi Province, has the highest multidimensional poverty index and incidence, indicating broader and deeper poverty. The second tier includes Pingwu County in Mianyang City and Yilong County in Nanchong City, both in Sichuan Province. Lizhou District in Guangyuan City, Sichuan Province, shows relatively better conditions with the lowest multidimensional poverty index and incidence among the six counties. Within the moderate multidimensional poverty range ($7 < k \leq 11$), Ningqiang County and Yunyang County remain in the first tier, while Tongjiang County in Bazhong City and Pingwu County are in the second tier, and Yilong County is in the third tier. Lizhou District continues to show the best performance. Within the severe multidimensional poverty range ($11 < k \leq 15$), although incidence rates are low across all counties, Lizhou District and Yilong County remain in relatively better conditions, while the other four counties show more severe S&T information poverty.

4.4.2 Analysis of Multidimensional Indicator Contribution Rates shows the contribution rates of each dimension indicator under different K values for multidimensional S&T information poverty in the Qinba Mountain region. After decomposing by indicator, several characteristics emerge:

(1) **Contribution Magnitude:** Three indicators contribute over 10% to the multidimensional poverty index: "talent introduction and evaluation reference" in the personnel dimension, "S&T information capability" in the education dimension, and "S&T industry information consulting services" in the industry dimension. Additionally, "S&T information supporting S&T intermediary services"and "S&T information evaluation and decision-making consulting" in the management dimension, and "awareness of new S&T medical tools" in the medical dimension each contribute approximately 8%. This indicates that the main causes of multidimensional S&T information poverty in the Qinba Mountain region are farmers' lack of S&T information capabilities and insufficient local support services for S&T information consulting and decision-making.

(2) **Trends in Contribution Rates Across Dimensions:** Five indicators show a pattern of first increasing then decreasing contribution rates: "talent introduction and evaluation reference," "S&T information capability," "S&T industry information consulting services," "S&T information evaluation and decision-making consulting," and "S&T information supporting S&T intermediary services." Four indicators show a pattern of first decreasing then increasing: "awareness of superstitious (pseudo-scientific) thoughts" in the education dimension, "S&T industry information promotion" in the industry dimension, "S&T expert database construction" in the personnel dimension, and "S&T innovation and entrepreneurship training" in the personnel dimension. The remaining six indicators show relatively stable contribution rates.

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5. Path Strategies and Recommendations

Based on the empirical results and analysis, the following development strategies are proposed to address the current state and characteristics of multidimensional S&T information poverty in the Qinba Mountain region:

5.1 Policy Pathway: Strengthen Attention and Top-Level Design

Governments should further emphasize rural S&T information poverty, accelerate the exploration of policy focal points, incorporate the comprehensive improvement of farmers' S&T information literacy as an important component of the future "rural revitalization" strategy, and clarify S&T information service support policies for newly lifted-out-of-poverty areas. Targets, tasks, implementation environments, schedules, and specific measures for rural S&T information poverty assistance should be formulated promptly.

5.2 Education Pathway: Enhance Education and Deepen Training

On one hand, strengthen S&T information education in rural schools in poverty-stricken areas by integrating scientific concepts, S&T awareness, and common S&T information skills into the curriculum system to cultivate scientific concepts and S&T information capabilities. On the other hand, improve the social training network for S&T information in poverty-stricken areas by introducing qualified vocational or technical colleges through regional cooperation to offer S&T information training programs, thereby comprehensively enhancing farmers' S&T information capabilities and literacy.

5.3 Industry Pathway: Innovation-Led, Scientific Organization

Strengthen scientific planning and organizational guidance by conducting in-depth research on current rural and agricultural S&T industry development models. Coordinate S&T industry development directions and assistance forms based on local characteristic resource endowments, adapting measures to local conditions. Accelerate the integrated development of poverty-stricken areas with high-level S&T institutions to innovate rural industry economic growth models.

5.4 Service Pathway: Improve Services and Establish Systems

Introduce high-level S&T think tanks and establish a batch of S&T information intermediary service institutions to serve government and organizational decision-making in poverty-stricken areas. Provide multi-type S&T information services including S&T information dissemination, information retrieval, and innovation and entrepreneurship training to create an S&T information service network for poverty-stricken areas.

5.5 Mechanism Pathway: Ensure Operation and Supporting Mechanisms

Improve the management mechanism for S&T assistance in poverty-stricken areas by promoting a joint meeting system for cross-departmental S&T assistance led primarily by S&T departments. Incorporate the implementation effects of S&T assistance policies in poverty-stricken areas into "rural revitalization" management assessments, and explore talent construction and sustainable development mechanisms for S&T assistance in poverty-stricken areas.

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6. Conclusions and Recommendations

This paper explores and constructs a multidimensional S&T information poverty measurement indicator system for China from the perspective of libraries enhancing S&T information literacy and capabilities in poverty-stricken areas and farmers. Using this indicator system combined with the A-F method, an empirical study was conducted in the Qinba Mountain region. The results demon-

strate that multidimensional S&T information poverty is widespread and severe in China' s poverty-stricken areas. At the individual indicator level, the personnel dimension indicator "talent introduction and evaluation reference," the education dimension indicator "S&T information capability," and the industry dimension indicator "S&T industry information consulting services" show the highest poverty incidence. At the multidimensional level, over 80% of the population experiences mild multidimensional poverty (deprivation in at least 3 indicators), over 40% experiences moderate multidimensional poverty (deprivation in at least 8 indicators), and over 10% experiences severe multidimensional poverty (deprivation in at least 12 indicators). Based on the deprivation status and contribution rates of different dimensional indicators, this paper proposes assistance pathways and strategies in policy, education, industry, services, and mechanisms to support the improvement of farmers' S&T information literacy and local S&T information capacity development in the Qinba Mountain region.

The constructed multidimensional S&T information poverty measurement indicator system and method will provide a theoretical model and practical data reference for library participation in S&T information poverty alleviation in China. However, this study has limitations: (1) The indicator system requires further refinement. Due to the undefined boundaries of library participation in S&T information poverty alleviation and difficulties in data accessibility, some compromises were made in dimension and indicator design, inevitably affecting scientificity and rationality. (2) The transferability and generalizability of conclusions require broader case verification across more regions, especially comparative studies among rural poverty-stricken areas, rural non-poverty areas, and urban areas to optimize the indicator system and more comprehensively reflect issues and formulate assistance strategies. These issues warrant further research.

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Author Contributions

Liu Yu: Designed the research framework and methodology, conducted literature review and field research, and wrote and revised the paper.
Yang Zhiping: Guided the research design and provided comments and suggestions during paper writing and revision.
Chen Yihong: Collaborated in field research and participated in analysis.
Lu Ying: Participated in research and discussions and provided paper revision suggestions.

English Abstract

The Measurement Index and Empirical Research on Sci-tech Information Multidimensional Poverty in China

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Abstract: [Purpose/significance] This paper explored and designed a set of China' s sci-tech information multidimensional poverty index system. Moreover, it conducted an empirical research and formulated assistance measures to promote the sustainable development of poverty-stricken areas and improvement of farmers' sci-tech information literacy in these areas. And it also provided reference methods and data for China' s sci-tech information poverty research. [Method/process] This paper focused on the overall goal of China' s sci-tech poverty alleviation, combined with the sci-tech information needs of farmers in poverty-stricken areas, and constructed a set of farmer' s sci-tech information multidimensional poverty measurement index system with 15 indicators of 5 dimensions comprising "education," "medical," "industry," "personnel" and "management," from the perspective of libraries improving farmers' sci-tech information literacy and sci-tech information capabilities in poor areas. Based on this, it used the A-F method to implement a case study in Qinba Mountain area. [Result/conclusion] The China' s sci-tech information multidimensional poverty measurement index system and measurement method based on the library' s perspective proposed in this paper could effectively reflect the current situation of sci-tech information multidimensional poverty in the Qinba mountains area, discovered the degree, distribution and key points of sci-tech information multidimensional poverty. Therefore, targeted assistance measures can be effectively formulated to promote the improvement of farmers' sci-tech information literacy and the development of regional sci-tech information capabilities in Qinba mountains area.

Keywords: library; sci-tech information poverty; multidimensional measure; Qinba Mountain area; assistance measures

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