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Natural Resource Dependence of Communities around the Giant Panda Protected Land Based on Livelihood Capital

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Abstract: As the flagship species of biodiversity protection, the giant panda has an umbrella protection function. China is committed to building a natural protection system with national parks as the main body to achieve sustainable development. In this paper, the sustainable livelihood analysis framework is used to study the livelihood of farmers in the surrounding communities of the giant panda protected land. Based on the data obtained from the field survey, the evaluation index of the natural resource dependence of the community farmers is established, and then the measurement model is constructed to analyze the main factors affecting the natural resource dependence of the communities. The results showed that: (1) The food dependence of farmers around the giant panda protected area is the highest (46.32%), followed by energy dependence (37.67%), and income dependence is the lowest (27.91%). (2) In terms of regional characteristics, the natural resource dependence of farmers is the lowest in Minshan and Qionglai, followed by Daxiangling and Xiaoxiangling, and Liangshan is the highest. (3) Physical capital has no significant effect on the natural resource dependence. The influence of human capital, natural capital, and social capital on the natural resource dependence is significant.

Keywords: livelihood capital; natural resource dependence; community; protected land; giant panda

Citation: Liu, M.; Qin, Q.; Zou, Q.; Wang, Y.; Wen, Y. Natural Resource Dependence of Communities around the Giant Panda Protected Land Based on Livelihood Capital. *Agriculture* **2021**, *11*, 1123. https://doi.org/10.3390/agriculture11111123

Academic Editor: Gioacchino Pappalardo

Received: 13 September 2021
Accepted: 8 November 2021
Published: 10 November 2021

1. Introduction

Giant panda protected lands are adjacent to community spaces and rich in natural resources. Because of the inconvenient transportation, information block, and backward production mode, there is no alternative livelihood for community farmers [1]. There are traditional and realistic reasons for the use of natural resources [2]. Natural resources of giant panda protected land are still the main source of livelihood for community farmers [3]. The overuse of natural resources in the habitat by the surrounding communities of the giant panda protected land results in the degradation and fragmentation of the habitat quality. This relationship is shown in Figure 1.

It limits the communication and diffusion between different populations of the giant panda and brings pressure and threat to conservation management [4]. The total number of giant pandas has increased, but there is a downward trend in several counties. For example, the number of giant pandas in Meigu, Mabian, and Jiuzhaigou counties decreased by 12%, 40%, and 29.54% [5].

Therefore, determining how to deal with the relationship between community development and giant panda protection can help the protection department to employ targeted measures to improve the efficiency of giant panda protection. It is of great significance for sustainable development to measure the dependence of community farmers' livelihood on the natural resources of the giant panda protected land and analyze its influencing factors.

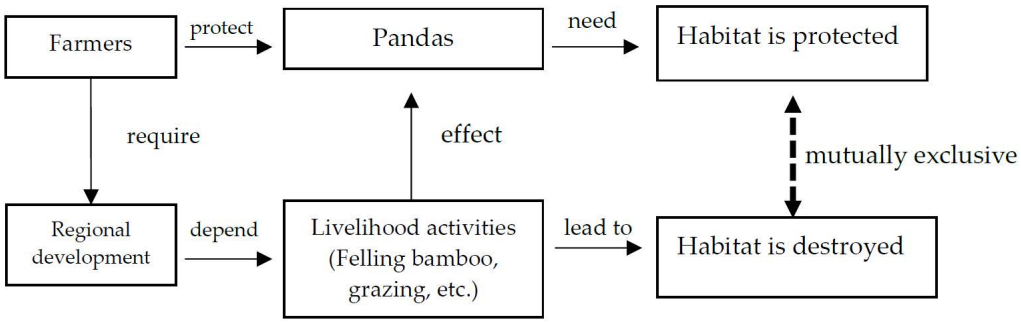

Figure 1. The contradiction between panda protection and community development.

The existing empirical analysis of farmers' dependence on forest resources has mostly referred to the definitions and methods in the "Poverty Environment Network Technical Guide". Bahuguna measures the dependence of farmers on forest resources by the proportion of income from forestry to the total household income [6]. Uberhuaga and others use the value of forest products and wages in forestry-related activities as forestry income [7]. Cordova et al. expressed income dependent on forest resources by the added value of forestry production activities [8]. On the whole, the existing empirical studies mostly regard the added value of natural resource-related activities as the income of farmers relying on natural resources from the perspective of operability. Of course, the income of these production activities is the production of natural resources, labor, capital, etc. The result is the joint action of production factors, so in this sense, these empirical studies overestimated the degree of dependence of farmers on natural resources.

This study is based on the framework of sustainable livelihood capital analysis to analyze the main factors affecting the dependence of natural resources. First of all, the entropy method is used to measure the livelihood capital of farmers in the surrounding communities. Then, the degree of natural resource dependence of the farmers' livelihood is calculated. Finally, the paper constructs an econometric model to analyze the influence factors of livelihood capital on the natural resource dependence of community farmers.

2. Regional Overview and Data Sources

The giant panda protected land has good vegetation cover and is rich in biodiversity. In this study, 20 typical counties with a total habitat area of 161.86 hm^2 were selected (Table 1 shows). According to the statistical data of counties, the economic ranking of these counties is mostly in the middle and lower levels, and some are even national poverty-stricken counties. Because of the single livelihood, the community relies on the natural resources of the protected land to develop its economy. With the growth of population, the demand for regional economic development is rising, which seriously threatens the ecological environment. Once the ecosystem balance of the protected area is destroyed, it is difficult to repair.

In this study, a questionnaire was designed at the level of farmers to study the natural resources dependence of the community and to seek a method for sustainable development. In each county, three administrative villages around the giant panda habitat were selected to carry out the household survey. A total of 1360 questionnaires were sent out, and each questionnaire was answered by one farmer. The effective rate of the questionnaire was 85.88% (1168). The main contents of the questionnaire include: (1) The basic information of the head of household; (2) the state of family resource endowment; (3) the main income structure and expenditure of the family.

Table 1. The research areas.

County	Town	Number of Samples
JIUZHAIGOU	DALU, ZHANGZHA	47
PINGWU	SIER, MUPI, BAIMA, TUCHENG	82
QINGCHUAN	QINGXI, QIAOLOU	68
SONGPAN	HUANGLONG, BAIYANG	35
BEICHUAN	PIANKOU, MACAO, XIAOBA	76
ANXIAN	QIANFO	33
DUJIANGYAN	HONGKOU, LONGCHI	58
LIXIAN	ZAGUNAO	29
WENCHUAN	WOLONG, GENGDA, YINGXIU	78
BAOXING	MUPING, YAOZI, MINZHI	65
TIANQUAN	QINGSHI, YUQUAN	32
SHIMIAN	LIZIPING, HUILONG	65
MIANNING	YELE, DAQIAO	59
LUDING	DETUO	27
YINGJING	FENGYI, SIPING	25
HONGYA	WAWUSHAN	26
EBIAN	JUEMO, LEWU	31
MEIGU	YIGUOJUE	25
MABIAN	YONGHONG	42
LEIBO	GUDUI, LAMI	60
	Total	963

3. Livelihood Capital

3.1. Index

The sustainable livelihood analysis framework developed by the Department for International Development (DFID) shows the interrelationship among the elements of livelihood. Many kinds of capital that farmers depend on for their livelihood can be roughly classified into five types: Natural capital, human capital, social capital, physical capital, and financial capital. The more capital the farmers have, the more flexible their livelihood strategies will be. On the one hand, it depends on the location of residence, and on the other hand, it depends on the regional development policy [9]. In this study, 16 indicators of livelihood capital were selected to construct the evaluation system (Table 2).

Table 2. Living capital indicator system.

Category	Index	Value
Human capital (H)	Age of household head (H1)	Year
	Sex of householder (H3)	Female = 1, Male = 2
	Education status of householder (H2)	Year
Natural capital (N)	Area of cultivated land (N1)	m^2
	Area of cultivated woodland (N2)	m^2
	Area of family residence (N3)	m^2
physical capital (P)	Number of electric appliances (P1)	1 Heater = 1 EU, 1 Rice cooker = 0.5 EU,1 Washing machine = 0.3 EU, 1 Television = 0.2 EU
	Number of household transportation (P2)	1 automobile = 1 TU,1 Tricycle = 0.8 TU,1 Motorcycle = 0.5 TU
	Number of household communication facilities (P3)	1 Computer = 1 CU, 1 Mobile phone = 0.5 CU,1 Telephone = 0.2 CU
	Number of livestock (P4)	1 cow = 1 LU, 1 sheep = 0.5 LU, 1 pig = 0.3 LU
Financial capital (F)	Total household income (F1)	Thousand yuan
	Household income from agriculture and Forestry (F2)	Thousand yuan
	Other kinds of household income (F3)	Thousand yuan
Social capital (S)	The number of businesspeople in the family (S1)	Person
	Someone in the family is the village manager (S2)	0 = None, 1 = Now, 0.5 = Once
	Whether to participate in the publicity or training of the protection management department (S3)	Yes = 1, No = 0

Notes: According to previous research by Sharp, Duan et al., and expert scoring method, EU refers to the unit of Electric Appliances Units, 1 Heater = 1 EU, 1 Rice cooker = 0.5 EU, 1 Washing machine = 0.3 EU, 1 Television = 0.2 EU.TU refers to the unit of transportation, 1 automobile = 1 TU, 1 Tricycle = 0.8 TU, 1 Motorcycle = 0.5 TU. CU refers to the unit of communication, 1 Computer = 1 CU, 1 Mobile phone = 0.5 CU, 1 Telephone = 0.2 CU. LU refers the unit of livestock, 1 cow = 1 LU, 1 sheep = 0.5 LU, 1 pig = 0.3 LU [10,11].

(1) Human capital is the core of all activities, which determines the ability of farmers to use other capital, mainly affected by the level of education, health status, the amount of labor, and so on. Referring to the research of Yan et al., this study selected the age of the head of the household, the education level of the head of the household, the permanent population of the family, and the number of non-agricultural people as the measurement indicators [12]. (2) Natural capital includes water, land, trees, and other natural resources that can be used for farmers' livelihood. In this study area, houses, forest land, and farmland are the main natural capital of farmers. Therefore, referring to the research of Li et al., this study selected the house area, forest land area, and farmland area as the natural capital indicators [13]. (3) Physical capital is the main asset for farmers to maintain their livelihood, including the means of production and basic facilities. Referring to the research of Li and Teng, this study selected the number of livestock, vehicles, and communication tools as indicators [14]. (4) Financial capital refers to the money (or equivalent) that farmers use to buy production tools and household goods, which can then be the income from selling crops, working outside, government subsidies, etc. According to the needs of the research, this study selected total income, per capita income, and agricultural and forestry income by referring to the research of Yang and Zhao [15]. (5) Social capital refers to the resources that can be used by farmers to achieve their livelihood goals, including social organizations, social relations, etc., which can enhance mutual cooperation and provide convenience for their livelihood. This study refers to the research of Li et al. and determined whether there were village cadres in the family and competent people who are good at management [16]. These two indicators have an obvious impact on the livelihood of farmers.

3.2. Weight of Indexes

In this study, the entropy method was used to assign value and calculate the weight of each index of livelihood capital; then the original value of each index was standardized and weighted to calculate the total value of livelihood capital. The entropy method is an objective weighting method that determines the weight of indicators according to the repeated information between indicators. The greater the weight is, the greater the relative change degree of the index is. The entropy weight method effectively avoids the subjectivity of artificial weight, so it is widely used in the research of various social and economic problems. The calculation is as follows:

First, the range transformation formula is used to standardize the indexes:

$$X_{ij} = \frac{X_{ij} - (min_i)X_{ij}}{(max_i)X_{ij} - (min_i)X_{ij}} \quad (1)$$

In formula (1), X_{ij} is the standardized value of index j of the i-th peasant household, and X_{ij} is its actual value. $(max_i)X_{ij}$ and $(min_i)X_{ij}$ represents the maximum and minimum values of index j, respectively. $0 < i <$ n, $0 < j \leq$ m.

Second, the specific gravity is calculated:

$$P_{ij} = \frac{X_{ij}}{\sum_{i=1}^{n} X_{ij}} \quad (2)$$

Third, the entropy value of index j is calculated:

$$e_j = -k \sum_{i=1}^{n} P_{ij} \ln P_{ij} \quad (3)$$

$k = 1/ln(n)$, $e_j \in [0, 1]$. e_j is the information entropy of the j-th index, which is a measure of the system chaos or disorder. For a given index j, the smaller the difference of X_{ij}, the larger the e_j.

Fourth, the weight of index j is defined as w_j:

$$w_j = \frac{g_j}{\sum_{j=1}^{m} g_i} \quad (4)$$

g_j is the difference in the coefficient of index j, $g_j = 1 - e_j$. According to the above steps, the entropy method weight of each index can be determined (Table 3).

Table 3. Livelihood capital weighting.

Category	Index	Weight	Formula
H	H1	0.0628	0.0628 × H1 + 0.0531 × H2 + 0.0906 × H3
	H2	0.0531	
	H3	0.0906	
N	N1	0.0825	0.0825 × N1 + 0.0387 × N2 + 0.0415 × N3
	N2	0.0387	
	N3	0.0415	
P	P1	0.0823	0.0823 × P1 + 0.0651 × P2 + 0.0876 × P3 + 0.0521 × P4
	P2	0.0651	
	P3	0.0876	
	P4	0.0521	
F	F1	0.0935	0.0935 × F1 + 0.0687 × F2 + 0.0935 × F3
	F2	0.0687	
	F3	0.0209	
S	S1	0.0765	0.0765 × S1 + 0.0473 × S2 + 0.0601 × S3
	S2	0.0473	
	S3	0.0601	

3.3. Farmers' Livelihood Capital and Its Regional Characteristics

Through the above calculation, we can obtain the livelihood capital of farmers. On the whole, the natural capital of farmers is the highest. It can be seen that farmers mainly rely on forest land and cultivated land for their livelihood. Financial capital is lower than natural capital and physical capital, and social capital is the lowest. The income of farmers is at a low level. Due to the lack of contact with the outside world, the social capital is low.

Each mountain's natural resources and human environment are different, so the livelihood capital of farmers has obvious regional characteristics. Table 4 shows the livelihood capital of farmers in each mountain. In general, the characteristics of the livelihood capital of farmers are as follows: Natural capital > Physical capital > Human capital > Financial capital > Social capital (Figure 2). However, the livelihood capital of farmers in the Minshan and Qionglai mountains is generally higher than that in the Daxiangling and Liangshan mountains.

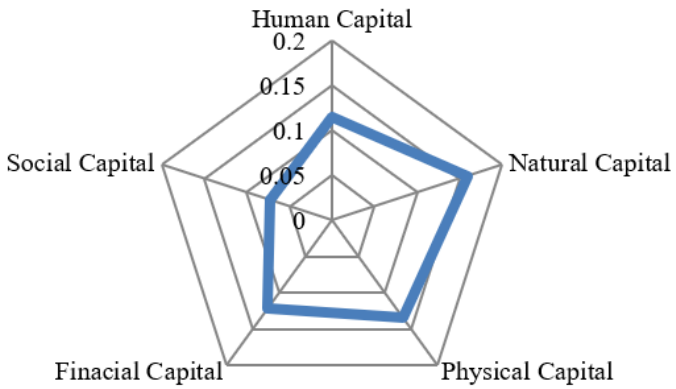

Figure 2. Livelihood capital of farmers.

Table 4. Livelihood capital status of farmers in different counties.

Mountain	H	N	P	F	S	Total
Minshan	0.115	0.161	0.123	0.116	0.075	0.590
Qionglai	0.117	0.152	0.118	0.105	0.067	0.559
Daxiangling	0.106	0.143	0.093	0.082	0.051	0.475
Xiaoxiangling	0.098	0.125	0.105	0.096	0.048	0.472
Liangshan	0.085	0.117	0.102	0.073	0.039	0.416

This is mainly because the community economic level of Minshan and Qionglai is higher than that of Daxianling and Liangshan. At the same time, the average education level of the household is high, so the human capital of the farmers is high. In addition, the community farmers in Minshan and Qionglai mostly carry out tourism and migrant work. Because non-agricultural and forestry income is higher, farmers have more financial capital. Liangshan has many national poverty-stricken counties. Because of the inconvenient transportation and lack of information, the livelihood capital is lower than other mountain communities. The average education level of farmers in Liangshan and Daxianling is low, and the amount of non-agricultural employment is small. The development of communities in Liangshan and Daxiangling mainly depends on the natural resources of the protection areas. Due to the extensive use of resources and the denser population in comparison to other mountains' communities, the development of this area is more likely to damage the giant panda habitats, and the pressure of protection is also greater.

4. Natural Resources Dependence

Based on the above calculation of livelihood capital, this paper calculates the natural resource dependence of farmers' livelihood, so as to explain the dependence of community farmers' livelihood on natural resources and the interference degree of the giant panda habitat.

4.1. Index

Some scholars believe that since natural resources are acquired or occupied, the value added from the consumption, exchange, and sale is the income of natural resources [17]. According to the economic characteristics of the research area and the research basis of previous scholars, the utilization of natural resources by farmers can be roughly divided into three uses: Income, self-sufficient food, and energy. Some scholars think that a community's dependence on natural resources includes three aspects: The income obtained by using natural resources, the food obtained from natural resources for families, and the household energy obtained by collecting firewood, which is defined as the natural resource dependence of income (Income dependence, ID), natural resource dependence of food (Food dependence, FD), and natural resource dependence of energy (Energy dependence, ED) [18]. Therefore, the following indicators are used to measure the dependence of farmers on natural resources.

Income dependence (ID) refers to the income obtained by farmers using natural resources. It mainly includes agricultural products planted in farmland and forest land, livestock products obtained from self-cultivation, and wild vegetables and Chinese herbal medicines collected in the field. The proportion of income obtained by the above means in the total income is the income dependence [19]. Grazing in the field and collecting Chinese herbal medicines are important ways for farmers to obtain income. These behaviors cause the habitat of the giant panda to become more fragmented and put greater pressure on the protection of the giant panda [20].

Food dependence (FD) refers to the proportion of food (such as food, poultry, livestock, vegetables, etc.) obtained by farmers using natural resources for household consumption of the whole family. The farmers around the protected area rely too heavily on local natural resources, so ecological protection is under great pressure [21].

Energy dependence (ED) refers to the proportion of energy (firewood, straw, etc.) obtained by farmers from natural resources in total energy expenditure. The energy consumption of farmers is mainly reflected in the daily cooking and heating [22]. Firewood is an important part of energy consumption in China's rural areas. Obtaining firewood brings puts pressure on resource protection. In addition to a small amount of natural gas, farmers mainly rely on burning straw and cutting firewood. Cutting firewood is the main energy source, which seriously affects the protection of the giant panda and its habitat [23].

4.2. Degree of Natural Resources Dependence and Its Regional Characteristics

Generally speaking, the natural resource dependence of farmers around the giant panda protected land is generally high. Table 5 shows the natural resource dependence of farmers. The per capita income of farmers from natural resources is 2024.45 yuan, and the average degree of income dependence is 27.91%, indicating that natural resources are an important source of income for farmers in the study area [24–27]. The average degree of food dependence is 46.32%. The mountain road of the giant panda protected land is rugged. Due to traffic and other reasons, most of the farmers' food is self-sufficient. The amount of firewood collected per capita is 178.49 yuan, and the degree of energy dependence is 37.67%. The order of the degree of natural resource dependence is Food dependence > Energy dependence > Income dependence.

Table 5. Farmers' dependence on natural resources.

Items	Mean Value	Standard Deviation	Maximum Value	Minimum Value
Annual income from planting industry (Yuan/Person)	1220.51	901.32	3216.50	100
Annual income from breeding industry (Yuan/Person)	654.39	3027.17	5019	0
Annual income from forestry (Yuan/Person)	309.21	5011.92	7329.30	0
Annual income from self-employed business (Yuan/Person)	879.03	1275.12	3563	0
Annual income from fiscal transfer (Yuan/Person)	301.20	623.29	1092.11	150
Annual income from property (Yuan/Person)	192.10	802.18	1945	0
Annual income from work outside (Yuan/Person)	537.86	1753.22	2109	0
Annual income from natural resources (Yuan/Person)	2024.45	542.02	5913.37	0
Gross income (Yuan/Person)	6007.30	1608.37	18,645.00	1134.76
Income dependence (%)	27.91	36.67	1	0
Self-sufficient food (Yuan/Person)	1218.75	1032.79	2732.63	0
Expenditure for food (Yuan/Person)	2537.59	2122.38	4832.63	0
Food dependence (%)	46.32	35.98	98.64	6.14
Firewood (Yuan/Person)	178.49	110.55	607.51	0
Expenditure for energy (Yuan/Person)	421.36	256.09	1531.27	0
Energy dependence (%)	37.67	42.73	87.51	0

Table 6 shows the natural resource dependence of farmers in each mountain. In general, the natural resource dependence of farmers in Minshan and Qionglai is the lowest, followed by Daxiangling and Xiaoxiangling, and Liangshan is the highest. Because of the convenient transportation in Minshan and Qionglai mountains, it is beneficial for farmers to go out to work or engage in self-employed business (such as opening farmhouses or shops). At the same time, these areas have good vegetation coverage, a beautiful environment,

and high-quality tourism resources, which are conducive to the diversified operation of farmers.

Table 6. Natural resource dependence of farmers in different mountains.

Mountain	ID	FD	ED
Minshan	21.35	40.22	32.16
Qionglai	29.56	31.98	35.73
Daxiangling	32.15	49.52	41.32
Xiaoxiangling	37.42	52.69	39.26
Liangshan	40.11	51.43	42.58

The livelihood strategies of farmers in Minshan and Qionglai mountain communities are diversified, greatly reducing the excessive dependence on natural resources, and reducing the pressure of giant panda protection. Daxiangling, Xiaoxiangling, and Liangshan are mostly mountainous areas with complex terrain and inconvenient transportation, which is not conducive to travel. The livelihood of community farmers mostly depends on traditional agriculture and forestry. The way of production and life is primitive and backwards. The main production modes of farmers are grazing, medicine picking, and shoot shooting, which are highly dependent on natural resources. The level of economy and education is very backwards. Luding County in Xiaoxiangling, Ebian County, Meigu County, Mabian county, and Leibo County in Liangshan are all national poverty-stricken counties. The income level of community farmers is low. The pressure of giant panda protection is much greater than that of the Minshan and Qionglai communities.

5. The Impact of Livelihood Capital on the Dependence of Natural Resources

In order to analyze the influencing factors of natural resource dependence, a Tobit model is constructed. This model consists of two parts: One is the selection equation model, which represents the constraint condition, and the other is a continuous variable equation model, which satisfies the constraint condition. When $y > 0$, $y = 1$ and is continuously distributed on strictly positive values. When $y \leq 0$, $y = 0$. The expression of the Tobit model is:

$$\hat{y}_n = \beta_0 + \beta_1 x_1 + \beta_2 x_2 \ldots + \beta_5 x_5 + \varepsilon \quad (5)$$

In formula (5), $\hat{y}_n$ is the natural resource dependence, x_1–x_5 are influencing factors of the natural resource dependence, and β_0–β_5 are parameters to be estimated for each explanatory variable.

In this paper, the Tobit model is built by using Stata 11.1 software. The dependent variable of model I is income dependence, the dependent variable of model II is food dependence, and the dependent variable of model III is energy dependence. Through the models' testing, pseudo = 0.138, Prob > chi2 = 0.0326, it is proved that the model fits well (Table 7).

Table 7. The influence of capitals on the dependence of natural resources.

Control Variable	Model I		Model II		Model III	
	Coefficient (Standard Deviation)	T-Value	Coefficient (Standard Deviation)	T-Value	Coefficient (Standard Deviation)	T-Value
H	−0.291 * (0.215)	0.76	−0.359 ** (0.205)	2.13	−0.264 (0.234)	−1.25
N	0.301 *** (0.125)	1.69	0.095 (0.228)	0.27	0.451 ** (0.234)	1.93
P	0.359 (0.268)	−1.34	0.021 (0.425)	−0.05	−0.159 (0.241)	−0.86
F	−0.337 ** (0.151)	−2.23	−0.018 (0.234)	0.08	−0.261 (0.215)	−2.27
S	−0.217 (0.185)	−0.68	−0.609 ** (0.281)	2.19	−0.376 *** (0.183)	−1.30

Note: ***, **and * denote significance at the 0.01, 0.05, and 0.1 levels, respectively.

(1) The influence of human capital, natural capital, and financial capital on natural resource dependence is more significant. Natural capital has a significant positive impact on income dependence. The natural capital of farmers increased by 1%, and the degree of income dependence increased by 3.01%. High natural capital makes it easier for farmers to rely on natural capital to obtain income, which also shows the positive and significant impact of natural capital on natural dependence [18]. Human capital has a significant negative impact on income dependence. Farmers' human capital increased by 1%, and the degree of income dependence decreased by 2.91%. The human capital in the study area is generally low, and the livelihood mode of farmers is single, which has a significant negative impact on income dependence. Financial capital has a significant negative impact on income dependence. Financial capital owned by farmers increased by 1% and the degree of income dependence decreased by 3.37%. The influence of physical capital and social capital on income dependence is not significant. The financial capital in the study area is generally low, and it is difficult for farmers to use financial capital to obtain income, which is also confirmed by the measurement results of model 1.

(2) Human capital has a significant negative effect on food dependence. Human capital increased by 1% and the degree of food dependence decreased by 3.59%. The human capital in the study area is generally low. Farmers' food mainly comes from self-sufficiency. The higher the human capital, the lower the food dependence. Therefore, human capital has a negative and significant effect on food dependence. Social capital has a significant negative effect on food dependence. Social capital increased by 1% and the degree of food dependence decreased by 6.09%. The higher the social capital, the more diversified the livelihood of farmers, and the lower the food dependence. Therefore, social capital has a negative and significant effect on food dependence. Natural capital, physical capital, and financial capital have no significant effect on food dependence.

(3) Natural capital has a significant positive impact on energy dependence. The natural capital of farmers increased by 1%, and the degree of energy dependence increased by 4.51%. The higher the natural capital, the easier it is for farmers to obtain energy by using natural resources. Therefore, natural capital has a positive impact on energy dependence. The social capital of farmers increased by 1%, and the degree of energy dependence increased by 3.76%. The higher the social capital, the easier it is for farmers to obtain new energy such as electricity and reduce the use of firewood. Therefore, social capital has a significant negative impact on energy dependence. Human capital, physical capital, and financial capital have no significant effect on energy dependence.

6. Conclusions

Identifying the dependence of farmers on natural resources helps to more effectively and accurately locate the farmers who need the most help, thereby improving the effectiveness of capacity building and realizing the sustainability of protection [17,28]. The participation variables of farmers in protected areas are generally considered to be related to resource dependence [29].

The food dependence of farmers around the giant panda protected land is the highest (46.32%), followed by energy dependence (37.67%), and income dependence is the lowest (27.91%). This is consistent with the results calculated by other scholars using the Heckman model [18]. They believe that farmers have a high degree of dependence on natural resources, with the highest proportion of income sources relying on natural resources. Food sources and energy consumption consume almost the same proportion of natural resources. In terms of regional characteristics, the natural resource dependence of the Daxiangling, Xiaoxiangling, and Liangshan communities is greater than that of the Minshan and Qionglai communities because the populations are greater in Daxiangling, Xiaoxiangling, and Liangshan. Due to the inconvenience of transportation, the communication between farmers and the outside world is limited, and farmers' livelihood is more dependent on the natural resources of the protected area.

Generally speaking, physical capital has no significant effect on natural resource dependence. The influence of human capital, natural capital, and social capital on natural resource dependence is significant. The giant panda protected area is very rich in forest and species resources. Animal husbandry products and medicinal materials are important economic sources for community farmers. Grazing and medicine collection are very common, which seriously damages the vegetation of the giant panda habitat. Other scholars also believe that due to the limitations of resource development models and economic development stages, surrounding communities over-exploit and utilize natural resources in protected areas [11]. Due to the interference of human economic activities such as resource development and land occupation [30], the giant panda's habitat is severely fragmented, and the balance of the ecosystem is threatened.

The pressure of community development on giant panda conservation is still a problem that requires attention in future conservation management. Improving the economic development level of the area where the nature reserve is located is conducive to attracting rural labor to engage in industrial and tertiary industry activities, increasing the wage income of farmers [31], and even attracting farmers to live in cities and towns, which can significantly reduce the dependence on natural resources. Therefore, we should develop green agriculture to increase farmers' income and reduce the pressure of community development on giant panda protection.

Author Contributions: M.L. and Y.W. (Yue Wang) drafted the manuscript, Q.Q., Q.Z. and Y.W. (Yue Wang): methodology; Y.W. (Yali Wen): investigation and formal analysis; Y.W. (Yue Wang): funding acquisition. All authors contributed to the writing of the manuscript. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Natural Science Foundation of Inner Mongolia (NO. 2020BS03001), the National Natural Science Foundation of China (No. 42061069).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest: The authors declare no conflict of interest.

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