

Article

Livestock Animal Displacement on Rural Tourism Destinations: Placing Livestock's "Pest" Role in the Background

Guorong Tang , Jinhe Zhang * and Yu Zhang

Department of Land Resources and Tourism Sciences, Nanjing University, Nanjing 210023, China; tangguorong8@foxmail.com (G.T.); zhangyu_0730@163.com (Y.Z.)

* Correspondence: zhangjinhe@nju.edu.cn; Tel.: +86-025-8968-1097

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Abstract: Rural tourism is becoming increasingly embedded in the livestock animal management in rural areas. Drawing on a multi-methods approach, this exploratory research shows how to construct the livestock animal displacement actor-networks. As is found, human actors (local governments, tourists, and local residents), non-human animal (livestock) and quasi-object (human dwellings) construct an interaction network in a structured way. The critical action route of livestock animal displacement demonstrated in this research is aimed to improve residents' participation willingness and further to change the local livestock feeding model and traditional dwelling by rural environment governance and rural tourism landscape consumption. Through the process of translation, problematization, interest, enrollment, mobilization and opposition, the livestock displacement actor-networks were constructed to build a heterogeneous network of the local government, tourists, local residents, livestock and human dwelling. The ultimate goal is to change the traditional human dwelling to a dis-dwelling; the most important thing is to promote residents' participation willingness in the livestock displacement actor-networks. This article attempts to perform compelling exploratory research to elucidate the livestock displacement actor-networks in hope to provide a meaningful contribution to the epistemology and methodology of livestock management on rural tourism destination and open a new path for research on rural livestock-human relations.

Keywords: rural tourism; livestock animal displacement; ANT; rural areas; rural development

1. Introduction

The nature of livestock-human relations is complex, ambiguous and dynamic [1]. Livestock is defined as animals that humans have domesticated. Dogs were the first domesticated animal, the domestication of which occurred as early as 100,000 years ago [2,3]. Since then, domesticated animals and humans have been depicted as dwelling together. At the same time, the placement and management of such partnerships has been a long-standing problem for humans for thousands of years. Originally, domesticated animals lived in the house with humans. For instance, the original meaning of the Chinese word “家 (jiā)” in Oracle and Bronze is “man-pig cohabitation”, which is an associative compound indicating that “豕 (shǐ)” (pigs) were inhabited in houses [4], thus illustrating the placement of domesticated animal in the house. Such dwellings exist as living examples around the world, such as Balaynatisa in Cebu, Philippines; Toraja's Tongkonan in Sulawesi, Indonesia; Newa's dwelling in Kathmandu, Nepal; dwellings in Thimbu, Bhutan; tower-like dwellings in Sana, Yemen; watchtower-like houses in Asir, Saudi Arabia; cave dwellings in Matera, Italy; Miniho in Portugal; granite dwellings in Trastos Montes; vineyard dwellings in Quercy, France; the Raab family farmstead in Michigan, America, etc. [5]. These reflect the special relationship between human and livestock dwelling, especially in the marginal poor and backward rural territories. Human and livestock

dwelling together in rural China is even more common, for which the placement of domestic animal is also a problem that continues to trouble villagers. Since 2005, the Chinese government has implemented new rural construction (NRC), and the separation of livestock from human residence has been projected into the political agenda and social practice as a desired change in the rural landscape, which combines livestock animal and rural tourism, improves animal resources and rural settlement, and benefits the rural area environmentally and ecologically.

Rural tourism is a multidimensional activity that links the peasant livelihood, agro-ecological and environmental components of sustainability [6–9]. Rural tourism is becoming increasingly embedded in the sustainable development of ecological environment system in rural areas, which has been identified as an important role to play in livestock animal placement and management, and whose development brings change to humans and livestock dwelling pattern. However, there are two binary cognitions of humans regarding livestock animal placement.

Livestock animal placed on rural tourism destination is used as a metaphor for “hosts”. Previous research in environmental management projects indicates that traditional special types and unique geographical types of domesticated animals contribute to the local identity, culture, and landscape characteristics [10–15]. Domesticated animals make a great difference to biodiversity, the conservation of preserved nature sites, the identity of local rural environments, and environmental heritage [15,16]. They are also an important part of the microscopic elements of human living environments, especially for rural human settlements [16]. Without the domesticated animals dressing, Heidegger’s “poetic dwelling” would not be a romantic notion. Such animals transform the cultural landscape of rural tourism into a living state [17,18] and are part of the tourist attraction [13,19–21]. Additionally, they serve as porters and ways of transportation for tourists; they compete with each other and are considered as competitors in sports for entertainment [22]. The cohabitation of humans with domesticated animals is considered to be a unique type of poverty and backwardness of a cultural landscape, thus becoming a tourist spectacle in slum tourism. Besides, domesticated animals contribute to humans’ lives and provide tourists with more choices of food [23].

Livestock animals displaced in rural tourism destinations are used as a metaphor for “pests” [24]. Domesticated animals are seen as bearing “contagious diseases” and are believed to be “environmentally dirty” [3,25,26]. Zoonosis refers to infectious diseases that are naturally transmitted between animals and humans. Human cohabitation with domesticated animals increases the risk of human and domesticated animal cross-infections and is not conducive to human and animal health. Manure that is not utilized and effectively disposed of in a timely and reasonable manner pollutes human settlements. In the Honghe Hani Terrace World Heritage area, livestock manure is the main source of terraced organic fertilizer. Traditional rushing and compost fertilizer is the ecological treatment of manure, in addition to dried animal feces which are also used as fuel. However, with the promotion of coal electricity and chemical fertilizers, manure handling oriented to ecological resources is interrupted and becomes an ecological burden instead. For one thing, rural sanitation is an important indicator of the quality in rural tourism [19]. For another, chances are that unexpected release of violent behavior of the animals themselves [27] may jeopardize the safety of tourists.

When the “pest” meets “host” status, the opposing views of livestock lead to identity conflict, and those involved in the livestock placement on rural tourism destination need to consider how to place the “pest” role in the background. According to the values of utilitarianism [20] and Goffman’s dramaturgical theory from a practical perspective [28], the most direct measure is to distant placement for livestock to place the “pest” role in the background. Aiming to seek answers as to how to set up an actor-network for livestock displacement, the present article gathers exploratory research from the perspective of actor-network on the questions as follows: What is the livestock displacement? What do the actors involved in the process of livestock animal displacement do? How to construct the livestock displacement networks?

2. Theoretical and Methodological Background

2.1. Animal Placement Theory

Livestock is defined as animals that humans have domesticated. The theory of animal placement research on animal geography provides a useful reference for this study. The placement of animal is a process in which animal and human lives are intertwined, and the theory focuses on the role of animals in human development in which they occupy unique spaces. Humans place animals in a specific space based on differences in species as well as preference, utility and domestication [29]. The scientific literature on geography has been extensively reviewed, in addition to the social construction of scientific knowledge and the theory of animal subjectivity [30]. The difference between domesticated animals and wild animals is the proximity of human and animal spaces. Decisive places such as livestock sheds, barns and breeding areas are designed and constructed based on the specific nature of the human and animal relationship and the relationship between human and livestock space.

Johnston searches for clues in individuals and groups in which humans and animal depend on each other for survival and reveals the necessity to construct geography that addresses the “animal dwelling” [31]. *Placing Animals: An Introduction to the Geography of Human—Animal relations* examines the study of animals within the context of geography and explores animal settlements based on the introduction to human and animal geographic relationships [32]. Regarding animals as figures in our cultural spaces [12], Buller argues that we arrived at a “more intimate and experienced set of lived and dwelt encounters with actual critters” [33]. Johnston explores spatial knowledge production [30], such as animal spaces and the settlement of domestic animals, which embodies crucial significance in understanding the concept of animal welfare given contemporary interpretations and social negotiation. The cognition, rights and treatment of different animal are taken as a social construction, and the adherence to arrangements of animals’ placement is maintained through time and space [12,13]. The animal placement in the wilderness or other spaces also bestows an inevitable ethical responsibility on humans [34]. Animals have been embedded in the process of the social and political development of humans [30]; the politics of dwellings [35] and dwelt political ecology [36] have also been seen as a tendency. The animal placement influences the infrastructure construction in human and animal co-habiting places in addition to the research agenda of human-animal geography.

2.2. Animal-Tourism Relationships

Tourism expands the interaction between humans and animals [20]. Literature on animal-tourism relationships and their impact on tourism research provide an epistemological foundation in the following areas: wildlife tourism [37–41]; rural and farm tourism [42]; zoo recreation and leisure [22,43–47]. Tourism activities take place in the wilderness, villages, farms, zoos, aquariums, and so on, in which animal dwelling places have an impact on individual animals, populations, communities and the habitats. Researchers of animal-tourism studies pay more attention to the animal’s body but less to the animal’s body placement; they are more concerned about the impact of tourism on the animal body but less about the impact of animal dwelling place as well as how to place the animal body; they emphasize more on wildlife and zoo animals but less on the equally important farm animals.

2.3. The Actor-Network Theory (ANT)

In epistemology, according to the General Symmetry Principle, ANT concerns a variety of factors with motility and manufacturing differences reflected in elements such as nature, society, humans, etc., which are referred to as the actors [48–51]. Actants are entities whose actions affect other actors and the entire network of actors [48,52]. Actors can refer to humans but can also refer to non-human existence and power. Human actors can be individuals or groups of humans [53]. With a methodological approach, ANT stresses scientific and social laboratory study, which records

and describes the ethnography of the actor's embodied actions, including how and why actions are taken [54,55].

ANT advocates ontologies in practice [56], stating that the existential structure of objects can be stable only after the process of realizing specified related-knowledge and objects, and there is no explanatory factor that exists outside the society [57]. The General Symmetry Principle proposes treating nature and society's explanatory function for scientific knowledge symmetrically and completing the tasks of deployment, stabilization and composition based on an analysis of actor translation and heterogeneous associations between the different actors through empirical research [48–50].

2.4. ANT in Animal Placement Research

Animal geography challenges the epistemology of the spaces and placement of humans and animals; critically, the methods we use engage with both in this relationship [58]. ANT is better understood as an approach or analytical sensibility with theoretical and methodological implications [48]. ANT, as a more-than-human ontology, had a significant influence on the theory and methods of animal geography [58,59]. It has become widely used within studies on non-human animals—notably between culture and nature as well as humans and non-humans—emphasizing relational practices and non-human agency with revealing multiplicities [27,53,58,60]. ANT emphasizes the socio-technological, human-relational imperative [60] as well as its apparent dismissal of the quality of life for animals in terms of being distinct from inanimate objects and machines [61] and indicates a predominantly functionalist approach [31]. One major contribution of ANT has been to reinforce the importance of ethnographic investigative methods and sensibilities within animal geography [58].

2.5. ANT in Tourism Research

The use of ANT thinking is increasingly evident in tourism research [62], and related academic publication in this field [63,64] shows a focus on the development of the tourism industry ontology, where it has been used to explore relational concepts, such as Tourismscapes [65], cultural tourism areas [66], the wildlife tourism focusing on the role of non-human actors [53], tourism academic research [67,68], the mechanisms of tourism entrepreneurship and innovation [69–71] and the generation of destination perception [72,73]. When applied to tourism research, ANT better reveals the relationship between tourism and local development [74–76]. These ideas have recently been applied to a range of tourism contexts and focus on the contribution of ANT to our understanding of the complexity of the tourism network. ANT offers a tourism researcher a practical, fieldwork-based orientation emphasizing detailed descriptions of relationships between human and non-human actors in the practice of tourism [62]. A literature review shows that ANT, based on the General Symmetry Principle and its heterogeneous networks and translation processes that emphasize the theory, can not only strengthen the theoretical construction of animal research [58] but also provide an effective research method and development policy practices for tourism research [62].

3. Research Preparation

3.1. Research Area

The cultural landscape of the Honghe Hani Rice Terraces is one pilot site under the protection of the Globally Important Agricultural Heritage Systems and is also on the World Culture Heritage List. The terraces are located in Hani, Honghe, Yunnan, in southern China and Yi Autonomous Prefecture (see Figure 1), where Laohuzui, Bada, and Duoyishu constitute the largest and most concentrated core areas of the Honghe Hani Rice Terraces. The eight villages of the Hani people (see Figure 1) that are located on the tourist route of the Hani terrace and are involved in the development of the tourism industry are selected: the Qingkou (folk custom village), Dayutang (folk custom village), Huangcaoling, Pugaolaozhai, Duoyishu-1, Duoyishu-2, Niuluo and Azheke. Rural areas are chosen

because of the uniqueness of human and livestock relationships and the human and livestock space relationships. Rural tourist area is a decisive spot for humans to place the subjectivity and bodies of animals.

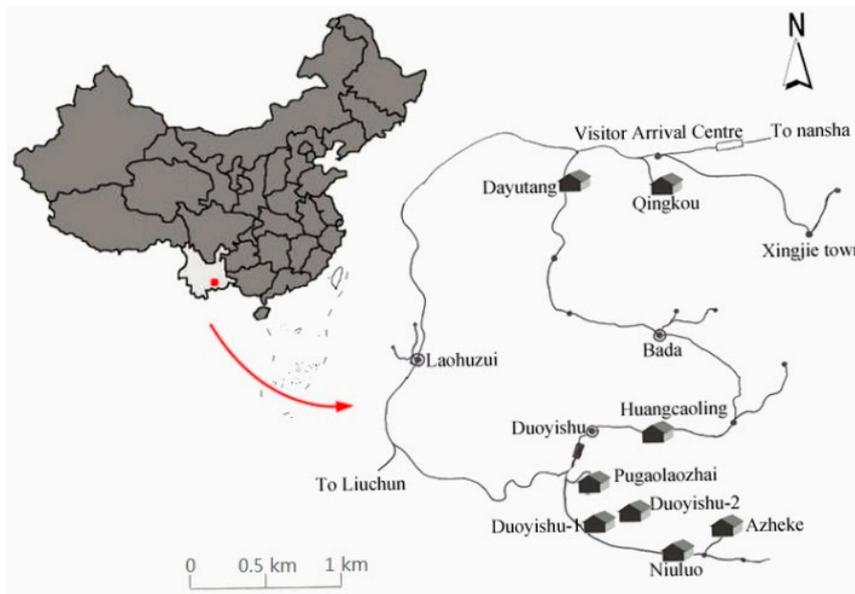


Figure 1. Location of the World Heritage Honghe Hani Rice Terraces in southern China’s Yunnan Province.

3.2. Research Design

Livestock displacement in rural tourist areas is an ambiguous phenomenon and a problem in discipline boundary, which requires the application of a multidisciplinary and interdisciplinary approach. This research serves as a synthetic route with progressive qualitative, quantitative and qualitative analyses (see Figure 2).

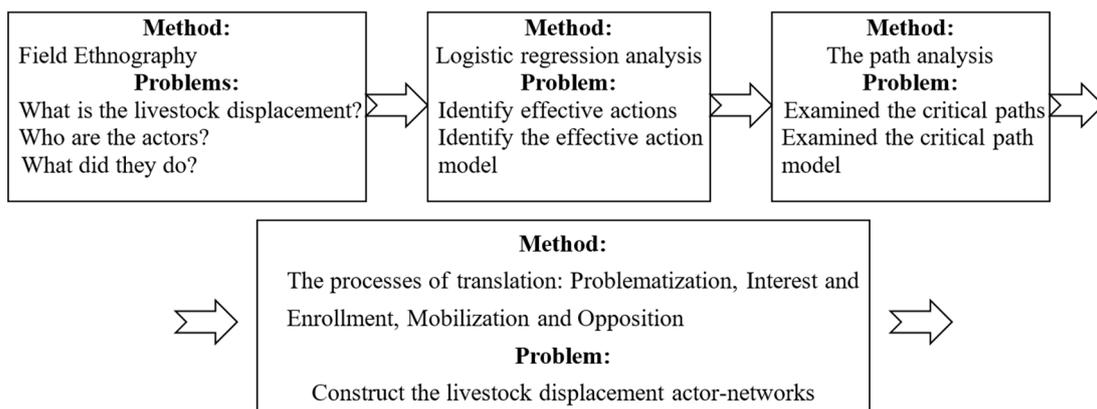


Figure 2. Graphical representation of the research approach.

Firstly, the research in discussion employed field ethnography to achieve the conceptualization of livestock displacement, recognize the actors, describe the actors’ embodied actions, and construct a conceptual framework of the actions association between actors. From the above, based on the empirical hypotheses of the fieldwork, hypotheses were proposed regarding the relationship between embodied actions and livestock displacement and a conceptual framework was constructed in terms of the actions association between actors based on experience.

Secondly, a binary logistic regression was applied to analyze the relationship between actors' embodied actions and livestock displacement. In this sense, identification of effective actions as well as a path analysis is hopefully achieved to analyze the connection between embodied actions, thus further to select an effective livestock displacement model.

Finally, research of ANT is centered on a detailed description of the association and relationship between heterogeneous entities [55,62]. Through the processes of translation, problematization, interest, enrollment, mobilization and opposition, the livestock displacement actor-networks were constructed to build a heterogeneous network. The association and relationship was tested out empirically and a deep analysis of the construction mechanism of livestock displacement was offered.

3.3. Fieldwork and Research Hypothesis

3.3.1. What Is the Livestock Displacement?

In the fieldwork on the Honghe Hani Rice Terraces from February 16 to 20 February 2016, a discovery was made as to the distant placement of livestock in rural tourism development. The notion of "livestock distant placement" can be defined in this way where the local residents select and plan suitable livestock production areas, design and construct the exclusive herding house for livestock, which allows human living spaces to remain a certain distance (spatial distance greater than 50 m) from livestock settlement to prevent zoonosis, reduce graziery pollution, and improve the dwelling quality and rural tourism environment (see Figure 3). Accordingly, the term "displacement" is a shortened form of "distant-placement", so the livestock placement on rural tourist destinations can be divided into two categories: displacement or non displacement (see Table 1). The displacement of livestock appears to be a simple process of action while in fact it is a complex process that involves correlation and interaction between various actors.

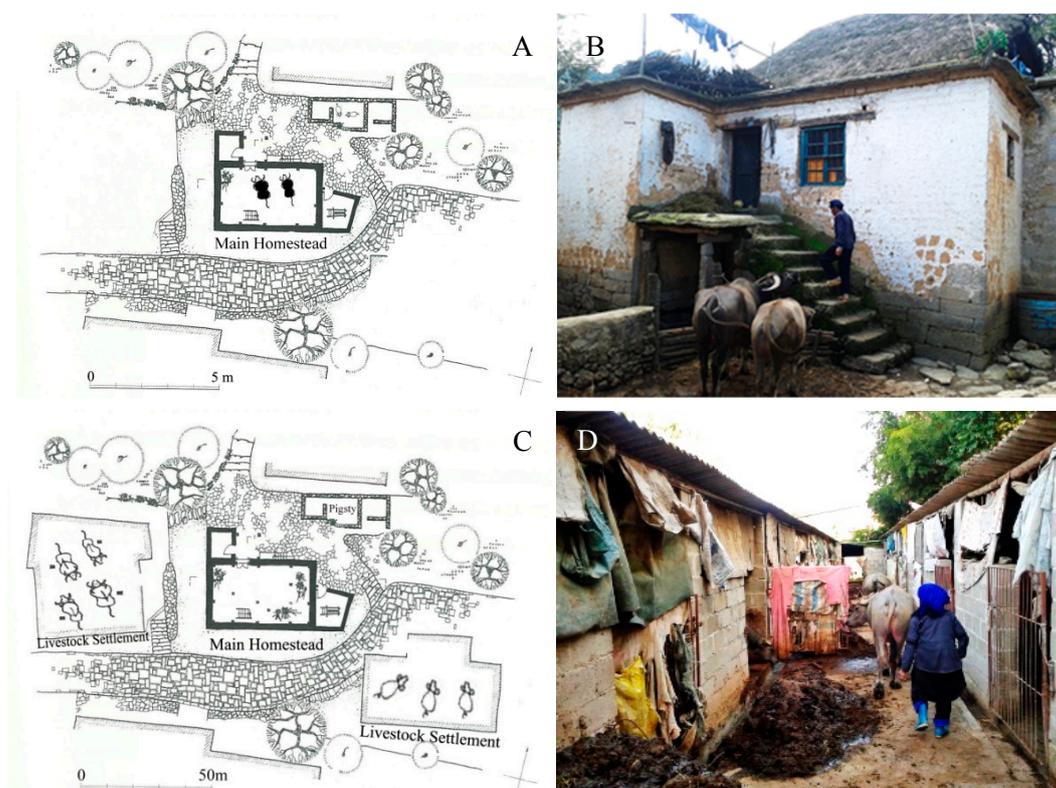


Figure 3. The process of livestock displacement (A–D).

Table 1. The conditions of livestock displacement

Villages	Population	Sample	Displacement Rate
QingKou	222	27	41%; has a concentrated livestock resettlement area; approximately 68–102 cattle can be housed in 34 cattle sheds; approximately 162–243 pigs can be placed in 81 pig sheds.
DaYuTang	101	64	50%; has a concentrated livestock resettlement area; approximately 90–135 cattle can be housed in 45 cattle sheds; approximately 102–153 pigs can be placed in 51 pig sheds.
HuangCaoLing	192	30	50%; no concentrated livestock resettlement area.
PuGaoLaoZhai	152	72	50%; has a concentrated livestock resettlement area. No cattle sheds; approximately 40–60 pigs can be housed in 20 pig sheds.
NiuLuo	57	39	50%; no concentrated livestock resettlement area.
DuoYiShu-1	96	24	52%; no concentrated livestock resettlement area.
DuoYiShu-2	106	42	50%; plans have been made for concentrated livestock resettlement areas, but they have not yet built.
AZheKe	82	54	50%; no concentrated livestock resettlement area.
Total	1008	352	41%.

Livestock displacement is closely related to rural sustainable development, which can be testified in the following aspects. First, as regards the sustainability of rural healthcare, livestock displacement can reduce the risk of zoonotic transmission and improve the health status of rural residents. Second, when it comes to the sustainability of rural ecological environment, livestock displacement can handle the livestock manure in a reasonable way, hence benefitting in reducing pollution and protecting the rural ecological environment. Third, in terms of the sustainability of rural human settlement, livestock displacement can manage livestock effectively and improve the quality of human and livestock habitation and rural living environment. Moreover, seen from the perspective of the sustainability of rural tourism, livestock displacement can prevent livestock from threatening the safety of visitors, enhance the rural tourism environment and make the tourism area more attractive.

3.3.2. Who Are the Actors, What Do They Do?

Livestock displacement is influenced not by simple human or animal factors but the interface between human and livestock interactions. Therefore, non-human factors should be taken into consideration. According to the concept of livestock displacement, six major actors should be included in the network: human subject (local residents; local government; tourists); nonhuman animal subject (livestock); quasi-objects or hybrid [52,77] (human dwellings and livestock herding houses). Correspondingly, these actors are linked to eleven actions.

Local Government:

Roles: Administrators and service staff, Xinjie Town government included, world heritage administration of the Yuanyang Hani Rice Terraces;

Embodied action 1: Rural environmental governance, through the pro-poor tourism and world heritage protection in rural tourism environment governance.

Embodied action 2: Comfortable housing projects—Local government provides indemnificatory housing for local residents through the earthquake-resistant and attractive housing projects.

Aims: Sustainable human settlement and comfortable housing.

The empirical hypotheses:

Hypotheses 1 (H₁). *Livestock displacement is the measure and approach of rural environmental governance, so rural environmental governance may promote livestock displacement.*

Hypotheses 2 (H₂). *Livestock displacement is the sub-project of the comfortable housing projects, so comfortable housing projects may promote livestock displacement.*

Tourists:

Roles: The other in the area of tourism, including rice terrace tourists, tourism photographers, and national culture tourists.

Embodied action 1: Rural landscape consumption—Reflecting the facility utilization and tourist gaze on rural landscape to tourist-targeted landscape consumption in rural tourism.

Embodied action 2: Authentic local experiences, for local photography, local dwellings, foods and folk customs.

Aims: Tourism-oriented rural landscape touristization [78], authentic locality.

The empirical hypotheses:

Hypotheses 3 (H₃). *The purpose of livestock displacement is to promote the rural tourism landscape environment to satisfy tourist consumer demand, so tourist rural landscape consumption may promote livestock displacement.*

Hypotheses 4 (H₄). *Livestock displacement changes the traditional human and livestock cohabitation cultural landscape and may affect tourist authentic local experience, so authentic local experience may restrict livestock displacement.*

Local residents:

Roles: Rural dweller, the proprietor of dwellings and livestock, the constructor of the rural environment, locals in displacement and non-displacement scenarios.

Embodied action 1: Resident's participation ability as presented in funds, skills, land and expertise of livestock herding and housing construction;

Embodied action 2: Resident's participation willingness as seen in displacement about cognition, emotions and attitude;

Aims: Possibility and degree of participation.

The empirical hypotheses:

Hypotheses 5 (H₅). *As the holder of livestock, residents need to have the ability to participate in livestock displacement, so resident's participation ability promotes livestock displacement.*

Hypotheses 6 (H₆). *As the holder of livestock, residents need to have the willingness to participate in livestock displacement, so resident's participation willingness may promote livestock displacement.*

Livestock:

Roles: Human co-dwellers, such as black pigs, buffalos, land ducks and local chickens; elements of the rural environment, rural tourism attraction, the object of the tourist gaze.

Embodied action 1: Local livestock quantity—Presented as the quantity of local livestock that local residents can herd.

Embodied action 2: Local livestock species—Presented as the regional mammal livestock that local residents can herd.

Embodied action 3: Local feeding model—As polyculture, scattered feeding and free-range housing.

Aims: Sustainable livelihood, sustainable reproduction, maintaining the nature essence of the animals and locality-keeping.

The empirical hypotheses:

Hypotheses 7 (H₇). *The larger the quantity of livestock is, the more placement space is required, and the more difficult it is to dispose of livestock displacement, so local livestock quantity may restrict livestock displacement.*

Hypotheses 8 (H₈). *Mammal livestock like buffalos, pigs, and so on, need more herding houses to place livestock body, so the mammal livestock species may restrict livestock displacement.*

Hypotheses 9 (H₉). *Livestock displacement is the way to change the traditional backyard free-ranging and stocking to captive and centralized feeding, so local livestock feeding model may restrict livestock displacement.*

Human dwellings:

Roles: Residence for local residents, the Hani mushroom houses provides special space to place human subjectivity and body;

Embodied action 1: Traditional dwellings presented as the hysteretic nature of Hani mushroom houses in which “humans live upstairs and livestock lives downstairs”.

Aims: Habitability and locality-keeping.

The empirical hypotheses:

Hypotheses 10 (H₁₀). *One of the livestock displacement purposes is to change the hysteretic nature of Hani mushroom houses in which “humans live upstairs and livestock lives downstairs”, so the traditional human dwelling style may restrict livestock displacement.*

Livestock herding houses:

Roles: Habitat space for livestock, providing special space for placing livestock subjectivity and body.

Embodied action 1: Livestock herding house construction, exclusively for livestock as presented in the organization, site selection, design to construction exclusive herding houses for livestock;

Aims: Comfortable livestock housing.

The empirical hypotheses:

Hypotheses 11 (H₁₁). *Livestock displacement herding houses must be built exclusively for livestock, so livestock herding house construction promotes livestock displacement.*

From the above, based on the empirical hypotheses of the fieldwork, eleven hypotheses were proposed regarding the relationship between eleven embodied actions and displacement (see Table 2) and the constructed conceptual framework of the actions association between actors was put forward based on experience (see Figures 4 and 5).

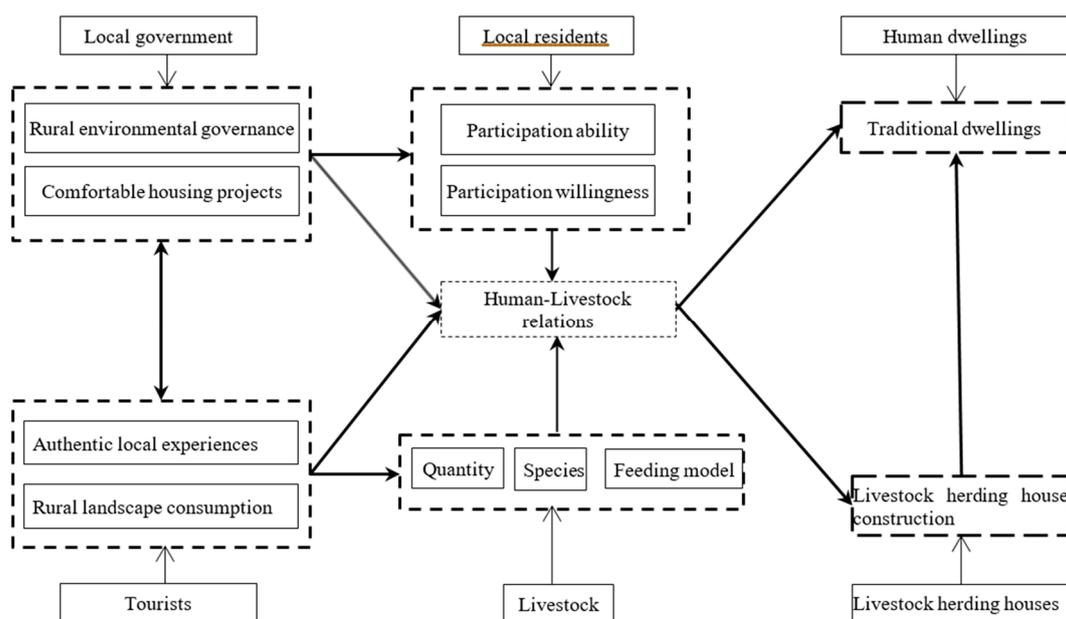


Figure 4. The constructed conceptual framework of the actions association between actors.

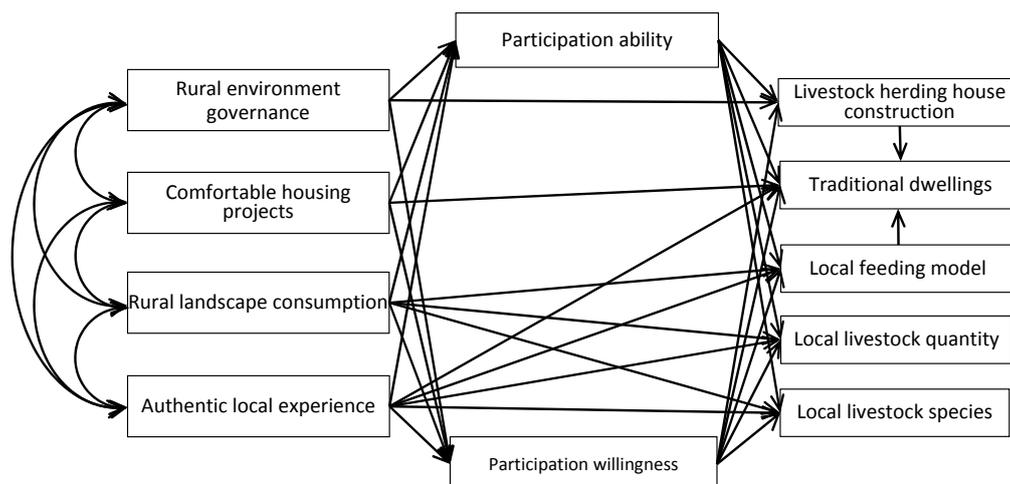


Figure 5. The Conceptual Action Framework.

Table 2. The Binary Logistic Regression Analysis.

Embodied Action Hypotheses	Collinearity Statistic		Logistic Statistic			Conclusion
	Tolerance	VIF	B	Wald	Sig.	
H ₁ : Rural environmental governance promotes livestock displacement	0.764	1.309	0.278	5.315	0.021	YES
H ₂ : Comfortable housing projects promote livestock displacement	0.801	1.249	0.394	12.162	0.000	YES
H ₃ : Rural landscape consumption promotes livestock displacement	0.775	1.290	0.219	4.241	0.039	YES
H ₄ : Authentic local experience restricts livestock displacement	0.939	1.065	−0.145	1.479	0.224	NO
H ₅ : Residents' participation ability promotes livestock displacement	0.793	1.261	0.114	0.653	0.419	NO
H ₆ : Residents' participation willingness promotes livestock displacement	0.934	1.071	0.292	4.645	0.031	YES
H ₇ : Local livestock quantity restricts livestock displacement	0.887	1.127	−0.006	0.002	0.964	NO
H ₈ : Local livestock species restricts livestock displacement	0.860	1.162	−0.173	2.613	0.106	NO
H ₉ : Local livestock feeding model restricts livestock displacement	0.942	1.062	−0.291	4.858	0.028	YES
H ₁₀ : The traditional dwelling restricts livestock displacement	0.843	1.186	−0.360	6.778	0.009	YES
H ₁₁ : Livestock herding house construction promotes livestock displacement	0.927	1.078	0.498	9.369	0.002	YES

3.4. Data Collection and Sample Representativeness

Based on fieldwork experience and the scattered literature about the livestock displacement [79–81], a resident perceptual questionnaire was created. The authors of this paper created a trial test of questionnaires, distributed and collected the questionnaires from 16 September to 28 October 2016 and adopted a simple random sampling method to draw 352 samples from a total of 1008 residents in 8 villages. Purposive sampling was used within families to select and determine which subject could use the Honghe dialect and express personal opinions effectively. The structural similarity of the sample and the entire pool suggests the reliability of the sample scale and the representativeness of sample [82,83]. In the 352-sample scale, the sampling error is lower than 5.5%, below the confidence level of 95% [84]. From the perspective of the demographic characteristics of the sample, males

account for 57.4% and females account for 42.6% of the total. Regarding educational levels, individuals with college degrees or above account for 0.9%; middle school, 14.5%; and primary school, 84.7%. In addition, the gender ratio of the whole pool shows that males account for 53% and females 47%. Regarding education of the whole sample, college degrees or above account for 0.2%, middle school 25% and primary school 72.2%, which implies that there are structural similarities between the sample and the whole.

4. Results: How to Establish the Actor-Networks?

4.1. The Effective Actions

The regression model was prepared and tested. The primary purpose of this research is to reveal the correlation between actions and livestock displacement. The dependent variable is a binary variable (0 or 1) under circumstances that are more appropriate for a logistic regression analysis [85]. The logistic regression model is susceptible to multicollinearity in the independent variables, so a multicollinearity diagnosis is performed before the model is fitted. Based on a tolerance of less than 0.2 and the variance expansion factor (VIF) more than 10 multicollinearity exists [86,87], the results show that there is no serious multicollinearity between the independent variables (see Table 2). We set “whether displacement” as a dependent variable and the eleven actions as the independent variables. By selecting the entered method, including the selected independent variables into the model, and computing the Hosmer-Lemeshow goodness-of-fit index, the standards probability of the variables that were introduced to or removed from models are $p \leq 0.05$ and $p \geq 0.10$, establishing a logistic regression model. According to the result output from SPSS21.0, the chi-square value of the Omnibus Tests of Model Coefficient = 29.795, $p = 0.000 < 0.001$ reached a significant level, indicating that the argument can effectively explain and predict category results of the samples on “Yes or No to livestock displacement” (see Table 2). For the Hosmer and Lemeshow Test = 12.028, $p = 0.150 > 0.05$, the results didn’t show a significant level, indicating that eleven independent variables created regression models with the desirable goodness of fit.

The effective action model is created regarding the comprehensive analysis of the plus or minus characteristic of coefficient B, the number of Wald and significance levels of Sig (Statistically significant at 5% level), and 7 effective actions that influence livestock displacement including rural environment governance, comfortable housing projects, rural landscape consumption, resident’s participation willingness, traditional human dwelling styles, local feeding model and livestock housing construction. Therefore, the conceptual model of the hypotheses can be optimized as the effective action model (see Figure 6).

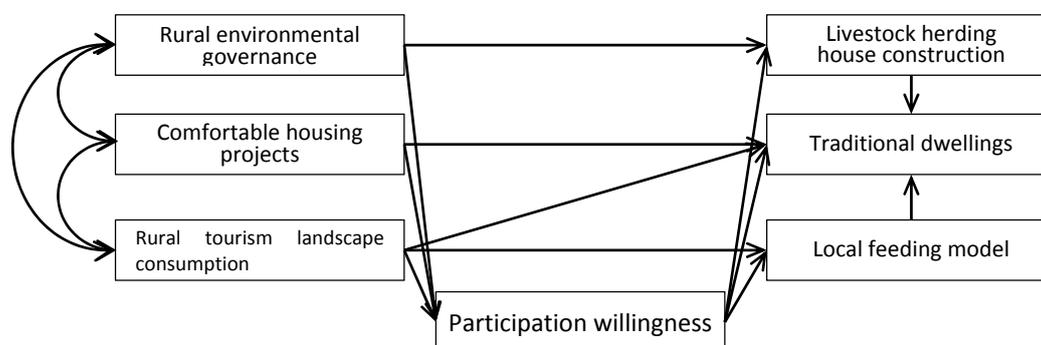


Figure 6. The Effective Action Model.

4.2. The Critical Paths

Model optimization: Based on the effective action model, SPSS Amos 21.0 grouping is employed in the current study to introduce variables; the endogenous variable adds an error term e_i ($i = 1, 2$,

3, 4) and establishes the recursive model (see Figure 6). It then imports the database, runs the model, considers the plus or minus characteristics of the output variable's co-correlativity matrix coefficient and eliminates routes that do not match expectations or have no significant functions. This research considers deleting seven routes: residents' participation willingness \leftarrow rural environment governance ($\beta = 0.102$); traditional dwelling style \leftarrow comfortable housing projects ($\beta = 0.021$); local feeding model \leftarrow rural landscape consumption ($\beta = -0.012$); livestock herding house construction \leftarrow residents' participation willingness ($\beta = 0.098$); livestock herding house construction \leftarrow rural environment governance ($\beta = -0.034$); traditional dwelling style \leftarrow rural landscape consumption ($\beta = -0.09$); traditional dwelling style \leftarrow livestock herding house construction ($\beta = 0.013$).

The critical path model: With the released model, optimized model and further reevaluated model, the Maximum Likelihood Estimates are applied to reevaluate the model and proves that the value of the coefficients of all routes reach a significance level at 5%. The β values of five route coefficients are all positive, which suggest that they have a positive influence on the criterion variable. The model abstract table presents the degree of freedom of the model fit measure as 4, the chi-square is 2.339, and the probability level is $0.674 > 0.05$, which indicates that the casual model of the hypotheses fits the practical research data and that the analyzed hypotheses model is supported. From the perspective of other fit measurements, the ratios of the chi-square degree of freedom ($\text{CMIN}/\text{DF} = 0.585 < 2.000$, $\text{RMSEA} = 0.000 < 0.050$; $\text{GFI} = 0.997$, $\text{AGFI} = 0.990$, $\text{NFI} = 0.998$, $\text{RFI} = 0.996$, $\text{IFI} = 1.001$, $\text{TLI} = 1.003$, $\text{CFI} = 1.000$) all meet the standard of above 0.9; FEMIN is 0.007, which is close to 0.000; the values of AIC, BCC, BIC, CAIC, ECVI in the default model are lower than the value of the independent model and saturated model, which suggests that the equation has a comparatively good imitative effect [88]. Therefore, the critical route of livestock displacement is, by virtue of rural environment governance and rural tourism landscape consumption, to improve residents' participation willingness to further change local livestock feeding model and traditional dwelling styles (see Figure 7).

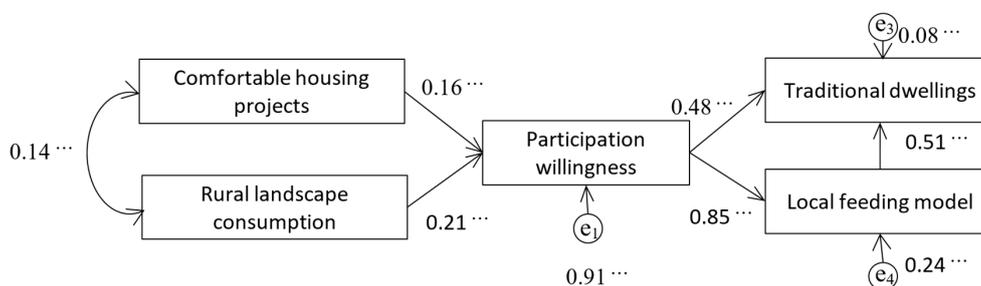


Figure 7. The critical path model (... Statistically significant at 0.1% level).

4.3. The Processes of Translation

4.3.1. Problematization

Problematization is the first step in establishing an actor network [53]. Its success relies on a principal actor pointing out the benefit of the realization approach of other actors, which problematizes the object that other actors focus on to form a network alliance and make the principal actor's problem become the obligatory points of passage (OPP) of other actors in achieving its aims [53,56,89]. By focusing on how to realize the goal of livestock displacement, the actors need to face the following problems. Local government needs to solve the problem of how to influence the residents' willingness to take part in livestock displacement through indemnificatory housing in comfortable housing project management. The way in which comfortable housing projects and rural tourism landscape consumption interact and collaborate with each other can positively influence livestock displacement. Local residents should strengthen awareness of the necessity of displacement to improve self-willingness, on the premise that it would have no effect on tourists' local experience in changing the traditional Hani mushroom house dwelling style and the local feeding model as polyculture,

scattered feeding and free-range housing. Among these five actors, residents are the proprietor of the dwelling and livestock, the dwellers of the rural area and the constructor of the rural environment. In this regard, the resident plays the role of principal actor for the whole network. Additionally, residents' willingness becomes obligatory points of passage (OPP) for other actors in achieving aims (see Table 3).

Table 3. The obligatory points of passage (OPP).

Actor	Action Barrier	OPP	Aim
Governments	Residents' dwelling requirements and willingness	resident's participation willingness	Comfortable and livable housing
Tourists	Resident and tourist sharing and translating the rural landscape		Rural landscape Touristization
Residents	The cognition, emotion and attitude of the livestock displacement		Active participation
Dwellings	Residents' habitual reliance on traditional dwelling		Dis-dwelling
Livestock	Residents' habitual reliance on local feeding model		House herding

4.3.2. Interest and Enrollment

Interest is a crucial phrase in ANT establishment. Based on the Problematization, the following roles of actors are defined again and transformed.

The government's role as manager has the power to allocate resources and providing indemnificatory housing, and its role of server is to offer funds, technology and expertise to create comfortable housing projects. At the same time, as a preponderant actor with knowledge and power, local governments should provide housing security to the locals and design livable housing for them. Additionally, the government should design and plan the livestock exclusive herding house as an important part of rural dwelling environment. Furthermore, the local government considers livestock displacement in comfortable housing projects to improve the locals' living environment. The Honghe Hani Rice Terraces World Heritage administration is responsible for the evaluation, utilization and protection of Hani traditional mushroom houses' heritage value.

Tourists are the rural tourism landscape consumer. Tourism demand directly affects the direction of tourism-oriented rural environments, such as rural landscape design and the construction of rural tourism facilities. Comprehensive benefits to the economy, culture and environment brought by tourism development directly influence locals' willingness. Clean and sanitary rural environments, the necessity of rural tourism facilities and rural security, require local residents to properly manage livestock and improve livestock feeding model and traditional dwelling style. The dis-dwelling of humans and livestock can effectively prevent livestock herding pollution and injury to tourists.

Local residents accept the government provision of indemnificatory housing, choose traditional mixed dwellings or dis-dwellings, and aim to achieve livable, comfortable and happy housing. Additionally, they take part in host and guest interactions, programs and designs for tourism-oriented rural landscape. As one way of generating a livelihood, livestock herding tends toward local free-range herding and stocking or concentrated house herding for livestock management.

Livestock animals are the co-dwellers with rural people. As human domesticated animals, the livestock feeding model reflects human-livestock relationships. Local herding method of polyculture and scattered and free-range feeding allows the livestock to live naturally and maintain the locality of the tourist area.

The human dwelling is a necessary residential space for local residents. In the evolution of tradition and modernity, the traditional mixed dwellings of humans and livestock negatively affect human health and dwelling environment management. However, the traditional dwelling style is an

attraction in rural tourism, which meets the tourists’ need to experience the local aesthetics and other aspects of the local custom.

All the factors mentioned above have redefined the roles that actors play. The enrollment of actors as alliance member strengthens and stabilizes the association between the subject and other actors through interest to consolidate network relations, defines and allocates roles through enrollment, transforms problems into specific narration, and allows for multi-coordination.

4.3.3. Mobilization and Opposition

Mobilization and opposition is the crucial phrase in network formation and transformation, during which the locals become spokespeople of the whole network alliance and exercise power over other allies to ensure stable performance of the network. There are two oppositions that need to be overcome in the process:

Opposition 1: Animal ethics related to humans and livestock. The local feeding model of free range herding and stocking emphasizes the freedom of livestock to live naturally, while concentrated house herding interferes with livestock’s freedom, welfare and natural habits.

Opposition 2: Locality-keeping. The changing of traditional dwelling styles and local herding methods threatens rural locality. In Honghe Hani Rice Terraces, the traditional Hani mushroom house mainly refers to a dwelling system where “people live upstairs while livestock live downstairs”; the local livestock feeding model mainly refers to the model of polyculture and scattered and free-range feeding. Livestock displacement separates human and livestock dwellings spatially and changes the feeding model from free range herding to house herding. The transformation of traditional dwellings and local feeding model will inevitably influence rural localities.

Therefore, during the process of livestock displacement, locals are the enrollment subject. Each actor is given an acceptable task. When an actor plays the designated role and finishes the task, the ANT is constructed (see Figure 8). Aside from the actor’s assignment of a monodirectional task, the corresponding task-receiver also needs to generate a response, which helps promote coordinated action.

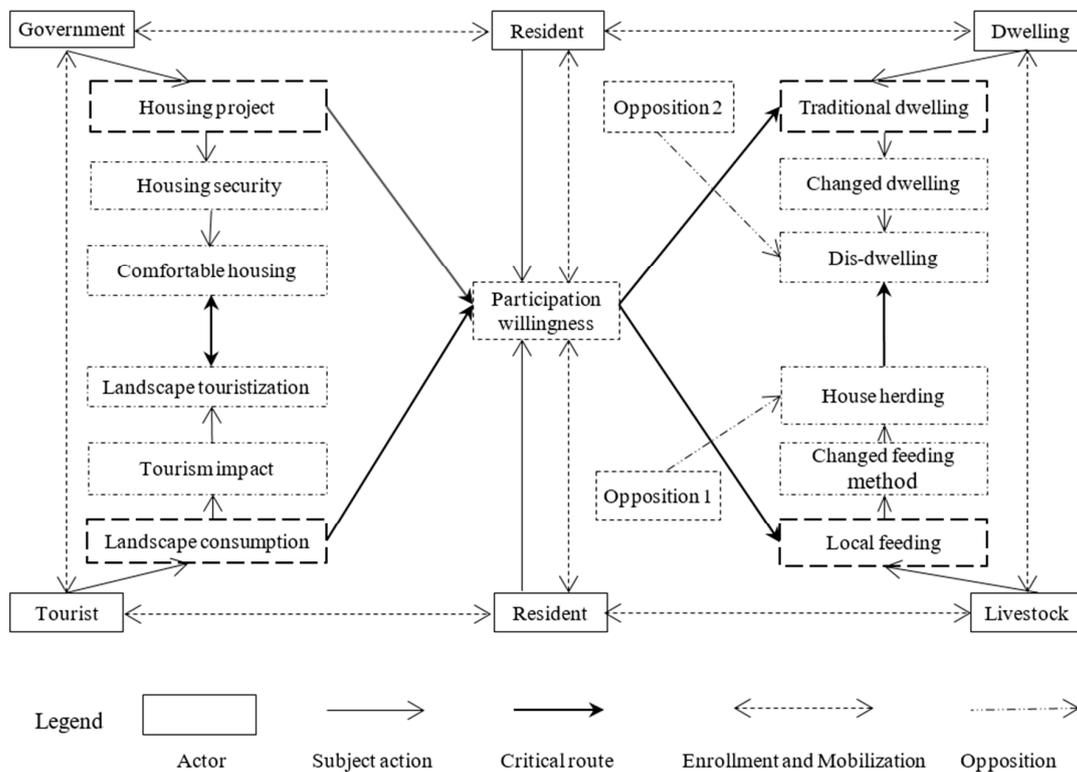


Figure 8. The livestock displacement actor-networks.

5. Conclusions and Discussion

5.1. Conclusions

This article gathered exploratory research on how to construct the livestock displacement actor-networks.

Livestock displacement is considered to be a process in which the local residents design and constructs the exclusive herding house for livestock, which allows human living spaces to remain a certain distance from livestock settlement to prevent zoonosis, reduce graziery pollution, and improve the dwelling quality and rural tourism environment. The livestock displacement actor-networks were constructed to build a heterogeneous network of the local government, tourists, local residents, livestock, and human dwelling. Correspondingly, the critical action route is to improve residents' participation willingness, by way of rural environment governance and rural tourism landscape consumption, and to further change local livestock feeding model and traditional dwelling styles.

Judging from the structure of the livestock displacement actor-networks, it is discovered that the location of local government and tourists at the forefront of the network, local residents at the center, livestock at the sub-center, and human dwelling at the rear-end. Seen from the sub-group, local government provides comfortable housing for local residents through the earthquake-resistant and attractive housing projects, and the comfortable housing projects promote livestock displacement. Rural landscape consumption impacts the tourism-oriented rural landscape touristization which reflects facility utilization and tourist gaze on rural landscape to tourist-targeted landscape consumption in rural tourism, and tourist rural landscape consumption may promote livestock displacement. Local resident is the holder of livestock, whose participation willingness is the obligatory points of passage (OPP) of the livestock displacement actor-networks, and it also promotes livestock displacement. Livestock displacement changes the traditional human dwelling to a dis-dwelling, for which the traditional human dwelling restricts livestock displacement. From the point of view of the role of the action path, the actions of the government and tourists affect the local population, thus affecting livestock and housing. From the direction of action path, the government and tourists affect local residents, sequentially affecting livestock and human dwelling. In sum, the ultimate goal is to change the traditional human dwelling into a dis-dwelling, and the most important thing is to promote residents' participation willingness in the livestock displacement actor-networks.

5.2. Discussion

The present research focuses on the farm animals on rural tourism destination in the hopes of making up for a circumstance where farm animals have not received enough attention in research on animal tourism. Not only the placement of the livestock animal body is mentioned, but the subjectivity of livestock is also taken into consideration. In theory, this study helps to understand the subjectivity of livestock in rural sustainable development and the role of livestock in the livestock-human relations, and suggests that livestock animal should be seen as one of the main subjects rather than insignificant non-human elements. In practice, it is possible to expand the research on livestock-human relations and exploration into the role of livestock in the networks is conducive to the effective livestock management in rural sustainable development.

In this paper, the application of ANT to the livestock placement research has a certain theoretical and methodological applicability. In epistemology, the livestock displacement is essentially the placement of the livestock body, while in the study in discussion, livestock displacement is a network composed of diverse actors, which is an effective action route. Animal geography emphasizes that since animals owes subjectivity in the human world, dealing with human and livestock relations need to pay attention to livestock subjectivity. Similarly, in the livestock displacement process, it is needed to pay more attention to the livestock subjectivity. According to the General Symmetry Principle, ANT also emphasizes the importance and activity of animals. In methodology, screening actors are based on extensive field surveys, from a logistic regression analysis, we find out the effective actions.

Through the path analysis, the causal relationship between the actions is analyzed. Based on the empirical and mathematical verification, the establishment of livestock displacement actor-networks has a certain reliability and credibility.

The ANT constructs the link between human and non-human action subjects in a structured way and divides the elemental mobility and the network interaction form among actors into the analytical category. By focusing on the process of juxtaposition and interaction between the actors and networks, the dynamics and patterns of the livestock displacement network construction are revealed, and the stability and possible development of it are analyzed [90,91]. By accepting the generalized symmetry principle of ANT and the emphasis on non-human actors in the study, the degree of attention to human and nonhuman animals and their relationship in rural tourism have been strengthened. This helps to explain the multiple effects of tourism in a complex phenomenon rather than merely using a human analysis on other actors, such as livestock. Furthermore, the reference and introduction of the ANT process research perspective and unique networking concepts serve as a good description of the evolution, connection and relationship of the problem of human and livestock animal relations in rural areas to achieve the translation of the problem. The micro-actor analysis reveals the causes of the macro-system, which can effectively link the causes and results. A micro and macro dichotomous analysis of the structure opens a new path for rural regional livestock management issues.

In the process of constructing the actor-networks, this paper focuses on the selection of actors and removes actors that are difficult to track to avoid the subjective influence determined from the action list and the scheduled framework of the actor network model [88,89]. The quantitative examination part is added in this article to enhance the objectivity and stringency of the actor network, and the concept and theoretical construction of ANT [92,93]. The simplification process starts from the hypothesis of the complex network model, goes to the effective action model and then to the critical path model, thus from cumbersome to concise and from general to critical. The actors gains emphasis in the process of building a network and is caused by different network uncertainties and redundancies. These measures can effectively compensate for the vulnerability of the ANT in policy practice guidance [85,94].

Simultaneously, the actor network compared to the network structure is more concerned with the dynamic evolution of the network that is constantly involved in the relationships between the actors [48]. The quantitative research may neglect the role of some potential actors and solidify some of the actors' paths, which need to be strengthened in future research. Additionally, livestock displacement is a comprehensive problem that affects human production, daily life, livelihood, housing, cognition, behavior and actions with regard to livestock itself, such as individual issues, population and ethics; rural ecology, environment and development require further examination of the network or the network relationship between other potential actors. Moreover, the body and part of the "pest" role are emphasized in the present study; the subjectivity and more about livestock's "pest" role in the network deserve further discussion. At the same time, there is greater need to find another chapter that discusses the livestock's "host" role and the actors in the placed livestock at the front desk network.

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