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IDENTIFICATION OF FOCAL ACTORS IN THE TRANSLATION OF THE RURAL TOURISM ACTOR-NETWORK: A CASE IN CHINA

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Abstract

The construction of rural tourism actor-network is an innovative transformation process, which integrates natural, economic, social and cultural focal actors of multi-functional agriculture in a rural area. The transformation process is a translation of these actors incorporated into a spatial distribution of landscape, which accelerates rural tourism through innovative integration. This study provides a method to measure and analyze the characteristics of focal actors in the translation process using actor-network perspectives. To identify focal actors in the translation process for the actor-network of rural tourism based on an actor-network perspective, face-to-face interviews and standardized questionnaire interviews are conducted with experts and scholars, tour operators, residents of local communities, and tourists. We examine the relationship between "in-closeness centrality" and "out-closeness centrality" of the actor-network in contrast with the actors themselves. The results show that Traditional food, Activity Participation, Leisure Services, and Protective Measures play the most important role in the actor-network. These are focal actors in building the foundation of innovation policy in the translation of rural tourism actor-network.

Key words: actor-network theory, translation process, social network analysis, rural tourism

1. Introduction

1.1. Background of actor-network theory (ANT)

This paper presents a method for identifying focal actors (FAs), which play a crucial role in enhancing the translation process in the construction of rural tourism network based on an actor-network perspective. Rural tourism is a complicated participatory process involving multi-players including societal stakeholders, administrators, policy makers, and practitioners. These processes play a role in pro-poor tourism in enhancing the welfare of residents and tourism workers in communities, and open up possibilities for accelerated innovative practices in rural tourism. The development of rural tourism actor-network is an innovative interaction of multiple interrelationships among the actors who operate in different ways at various points during production, exchange, and consumption. FAs are the key players in a rural tourism network who preliminarily investigate the factors influencing collaborative regional network activity.

Actor-network theory (ANT), which emerged in the 1970s, was proposed by the French sociologists Bruno Latour, Michel Callon, and John Law, who were associated with the Paris School of the sociology of science (Law, 1992). They believed that the human-centered dual exposition that clearly divides things into "natural," "social," "human," and "non-human" was not applicable in thinking about the world around us, and saw the scope of an actor as being extended far

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beyond that of individual humans in the actor-network (Jensen, 2001). According to ANT, all objects exhibit some dependency on each other; therefore, the closer in space they are to one another, the more essential they are to each other (Allen, 2011). ANT emphasizes the roles that both human actors and non-human actors play in the performance and outcomes of the interactions between objects (Harty, 2008). As a result, ANT has become more widespread within rural sociology, mostly in studies of food networks and organic farming (Noe and Alrøe, 2003).When ANT is applied to tourism research in rural development, the theory helps to sustain people's health, livelihoods, communities, and ecosystems (Gliessman 2011; Jóhannesson, 2005; Murdoch, 1998). Rural tourism actor-network includes heterogeneous elements such as natural and human elements, which are not converged as a matter of course, but rather through a translation process that builds up an actor-network (Fadeeva, 2005; Jóhannesson, 2005; Saxena and Ilbery, 2008).

ANT is a socio-philosophical approach that attempts to comprehend complex social situations by attending to relational heterogeneous elements, which are referred to as "associations" in ANT terminology (Latour, 2005). As an innovative research approach in tourism studies, ANT was used as a theoretical approach to analyze the development of wildlife tourism science in the Australian Antarctic Division and other tourism studies (Rodger et al., 2009;Van der Duim and Caalders, 2008). The main function of an actor-network is to integrate the natural, economic, social, and cultural factors in the rural tourism, such as soils, plants and animals, machinery, humans, knowledge, institutions, and enterprises that serve as the players. This is also an important contribution towards sustainable rural development, because it enhances multi-functional agriculture and helps retain existing amenities (Zheng and Liu, 2013b).The integration of rural tourism actor-network includes two main "bundles" of networks: "vertical" networks that link rural spaces to the agro-food sector, and "horizontal" networks that link rural spaces to the more general and non-agricultural processes of economic change. Integrated rural tourism with actor-network theory constructs an eco-experience-scape (i.e., Ecological-experience-landscape) that tends to have high levels of significance and is often part of the local social, cultural, and recreational life of the local people (Zheng and Liu, 2010). Not only does the term "actors" refer to the people involved in rural tourism-relevant networks, but it also refers to soils, plants, and animals (Zheng and Liu, 2013a).This means that rural tourism is characterized by a great structural complexity in multiple forms of this service (Pomeanu and Teodosiu, 2012).

Within the rural tourism network, various heterogeneous actors are aligned in terms of organizations, machines, animals, and more. The key to building successful rural tourism using actor-network theory is to incorporate the natural, biological, and intelligent processes of the heterogeneous factors of the rural areas into the translation of a new network (Jarosz, 2000). Translation is a process of constructing innovative space, which generates the effect of establishing identities and conditions for interaction, and characterizes representations. As a transforming process, the translation examines why some networks become established and why others fail. The translation process in a rural actor-network is indeed an innovative process in converging agriculture with tourism (Hernández-Mogollón et al., 2011). Therefore, ANT provides a paradigm of a heterogeneous network consisting of human and non-human factors such as food production, technology, capital, arable land, flora and fauna, and so on in an innovative transformation process.

1.2. Translation process

The translation process incorporates heterogeneous actors that have social and natural origins into a uniform framework of interpretation (Law, 1992). The interests, roles, functions, and status of each heterogeneous actor are redefined, sorted, and reinstituted in the new actor-network to build an integrated innovative space that is compatible with ecological, industrial, social, and recreational functions and that lead to the realization of the ecological, economic, social, and cultural goals of rural tourism actor-network. In the construction of this new multi-functional space, this translation contributes to the improvement of interaction at a micro level among heterogeneous elements in the agro-ecological process (Arnaboldi and Spiller, 2011).

Translation process can successfully bring various actors together and integrate rural tourism with natural and social capitals to attain network stability through the interrelation and convergence of actors. Each actor plays an active role in translation process reaching each of their goals and in ensuring that the actor-network strategy is balanced. Translation theory highlights the process of problematic transformation and the identities involved in the construction of a rural development network (Magnani and Struffi, 2009).In addition, the translation of rural tourism actor-network contributes to the integration of the institutional framework in its strategy for "building a new countryside," and this is characterized by advanced production, improved livelihood, clean and tidy villages, a civilized social atmosphere, and efficient management (Long et al., 2010). The goals for the successful translation of rural tourism actor-network are "rurality," "innovation mode," "high service quality," and "ecological stability." These four goals are determined by the FAs in the network's social, agricultural, tourism, and ecological dimensions, and can effectively lead the other actors to complete the translation through Obligatory Points of Passage (OPP). The first condition necessary for the construction of this kind of rural tourism is the identification of OPP existing between all actors in the network. The preferred

choice in this study is to use the network centrality indices to identify the FAs.

As a feature of actor-networks, OPP is usually associated with the initial phase of a translation process. OPP can be thought of as the narrow end of a funnel that forces the actors to converge on a certain theme, purpose or question. OPP is a narrative point through which all network transactions pass in a minimum conditional limit (Kitchen, 2000). Naturally, the identification of the FAs becomes the key to the success of the translation process in the construction of new space of rural tourism. Affected by the FAs in rural natural, social, industrial, and institutional environments, the OPP are closely related with the various key actors in the network, and these relations form the theoretical basis of the social network analysis (SNA) (Gertler, 1996). Social network analysis (SNA) is the analysis of social relationships in terms of network theory. SNA can be an invaluable tool for systematically assessing and then analyzing relationships of rural tourism actor-network.

The identification of FAs is reliant on the strength of the relations between the actors in the tourism network. The network centrality indices are important for the SNA-based explanation of correlations between the network and its actors (Hatala, 2006; Otte and Rousseau, 2002). These indices are mainly degree-centrality, between ness-centrality, and closeness-centrality (Butts, 2008). This study employs closeness centrality (in-closeness centrality and out-closeness centrality) to identify the FAs of translation process in the construction of the rural tourism using actor-network theories.

1.3. Framework of ANT rural tourism

The actors in rural tourism actor-network are "hybrids" of nature and society (Murdoch, 1997). The construction of such an integrated network is built on the equal treatment of non-human actors (ecological landscape, distance, historical sites, folk craft and society, history, language, technology, and agricultural industrialization) and human actors (individuals and organizations) (Cheng, 2017; Guzmán and Woodgate, 2012; Magnani and Struffi, 2009; Noe and Alrøe, 2012; Young, 2006). This means that non-human actors and human actors could be integrated into the same conceptual framework as integrated rural tourism. On the basis of the integrated characteristics of setting, activity, and benefits of integrated rural tourism, the actor-network framework is constructed by the actors of the agriculture industry, rural society, agro-ecological environment, and tourist activity.

This actor-network framework is mainly composed of the following rural tourism factors: rural society, tourism activities, and agro-ecological environment components, all of which are heterogeneous elements (Oerlemans and Assouline, 2004; Trauger, 2009). In this framework, all activities are conducted on a scale and scope not restricted to any geographical, organizational, or political boundaries (Schweitzer et al., 2009; Vandermeer and Perfecto, 2013). Therefore, the actor-network framework constructs an innovative knowledge of both tangible and intangible factors in rural tourism including traditional farming, cultural differences, folk customs, and rural territorial boundaries.

The framework helps to coordinate the internal and external goals, vigorously grow a multi-functional agriculture-based valley ecological economy and enhance the sustainable development of rural integrated tourism attractions (Fig. 1). In this framework, rural society, agro-ecological environment, and agricultural industry are interactive ties within the network.
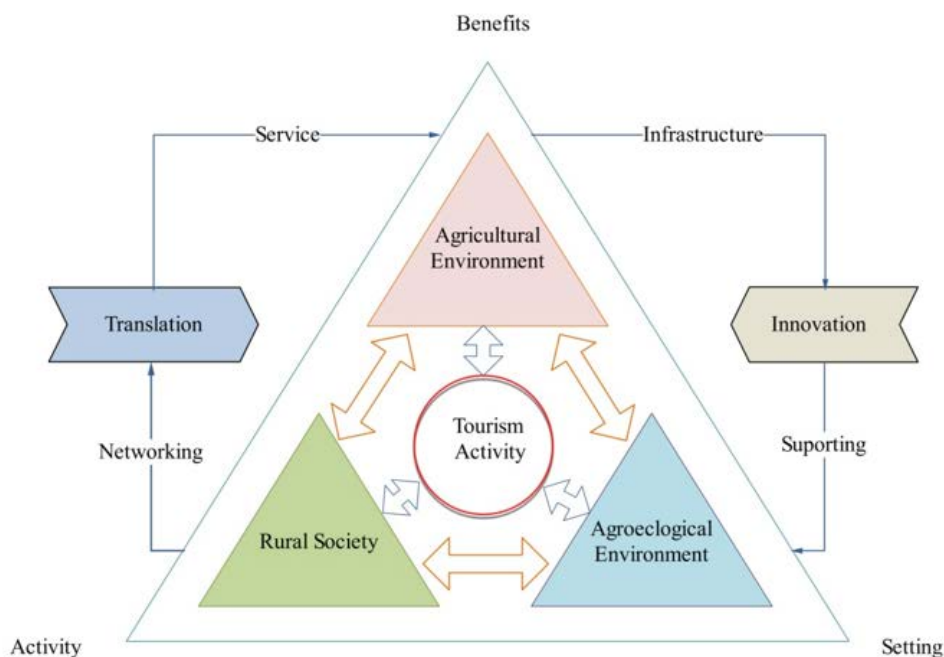

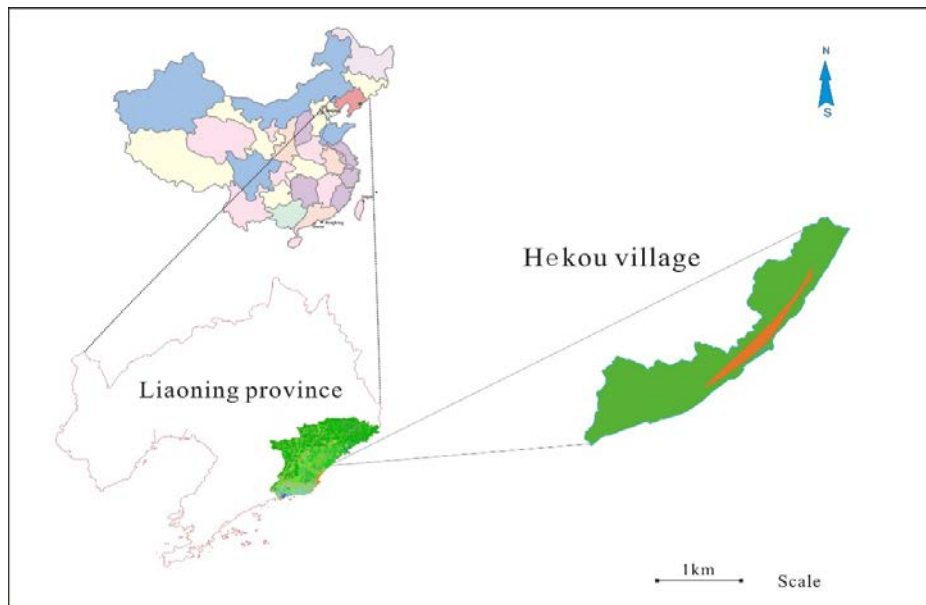**Fig. 1.** Framework of the rural tourism actor-network

Fig. 2. Location of Hekou Village in Liaoning Province, China

The comprehensive effect contributes to the establishment of a strong regional image for enhancing the competitiveness of brand perception in the relevant rural tourism research ethics and practices. We attempt to investigate the process and effects of rural tourism actor-network and how it is performed through a range of technological and institutional practices.

2. Methodology

2.1. Study area

This study was conducted in 2012 in Hekou, a border village in the eastern part of the province of Liaoning, China. The village overlooks Shimizu County (청수군, North Korea) across the Yalu River, which is one of the closest in location to North Korea. Hekou Village is a rural subsistence farming community with a total population of 2,895 in 910 households. The village, covering an area of 18 km^2, is the core scenic spot of the Yalu River scenic area for rural tourism in the border area, and therefore is selected as the main research site (Fig. 2).

The Yalu River is a boundary river between China and the North Korea, originating from an altitude of 2,300 m at the southern foot of the main peak of Changbai Mountain and flowing 795 km to the southwest. The river covers approximately 400 km^2 and runs through Jilin Province and Liaoning Province before plunging into the Yellow Sea near Donggang City. The Yalu River scenic area is located over the 210 km section of Liaoning Province in the middle and lower reaches of the Yalu River, and consists of Lujiang, Shuifeng, Taipingwan, Hushan, Daqiao, and Jiangkou scenic spots that include a 2-km field of vision along the Yalu River. It is a national key scenic area that is mainly centered on the landscape of China and North Korea along the Yalu River.

The region where Hekou Village is located is characterized by green mountains and a broad blue river (800–1500 m wide). Tourists can take a cruise tour on the Yalu River to experience the exotic scenery. As the Yalu River shoreline is considered to be the borderline between China and North Korea, a cruise can travel as close as possible to the other side without crossing the border, provide that the passengers do not disembark, so that visitors can appreciate the border scenery on the North Korean side and stay at a farmer's house to have a peek at the life of people in Shimizu County across the river. Hekou Village, with a mild climate and abundant rainfall, boasts a favorable agro-ecological environment suitable for crops, especially red peach (*Prunus persica* L.) growing along the waterfront of the Yalu River. This location has indeed become the main red peach fruit production area in northeastern China. Its fruit production, beautiful scenery, and aquaculture centered on freshwater fish farming are an invaluable economical resources for the villagers.

Hekou Village has the potential to expand its border tourism as a part of multi-functional agriculture because of the beautiful border landscape, which laid the foundation for the development of integrated rural tourism along the Yalu River. China has implemented a very strict policy of forest preservation. As a result, the forest on the Chinese side along the river is well preserved, with about 85% forest coverage. The population of wild boars, black bears, squirrels, and other wild animals has significantly increased with improved ecosystem services within the Yalu River Basin. Between 2006 and 2010, the water quality of the Yalu River and its major tributaries reached Class II standard, and the overall water quality of the river is currently rated as excellent.

China has experienced rapid transitions since Deng Xiaoping launched economic reforms in 1978. Over the past 30 years, the traditional agriculture of

Hekou Village has shifted from growing food crops as the leading industry to multi-functional agriculture centered on specialized production such as the red peach (*Prunus persica L.*) and chestnuts (*Castaneamollissima Bl.*). Rural tourism is developed in the base of the mountainous valley and by the Yalu River, provided that the agro-ecological environment remains undisturbed. With the multi-functional agriculture, traditional agricultural structures have improved and been up-graded, and rural tourism in the village is promoted. Community locals and tourists have benefited tremendously from the growing peach industry since the transformation from traditional agriculture. This fruit is a late-maturing peach with a long growing season (maturing in mid-August), which tastes good, looks pretty, and is of superb quality. As a native species, the red peach is suitable for growing on the hillside along the Yalu River. Each spring, the river is overwhelmed by peach blossoms on both sides, attracting an influx of tourists from home and abroad. This has also opened the door for the development of rural tourism. The beautiful scene of blooming peach flowers in spring (late April–early May) is depicted in the song "The Place of Peach Blossoms," which is known by almost every Chinese household. In addition, the song adds a cultural touch to the rural tourism of this place.

Hekou Village has a variety of productive cooperation and border tourism programs including the Peach Flower Festival along the Yalu River, sightseeing along the border area and visiting Korean folk villagers on Changhe island (China). At the same time, as the number of local specialty cuisines, featured breakfasts in bed, unique participation projects, and other services increase, tourists are provided with integrated ecological experiential benefits that are associated with ecological environment, industries, landscape, folk customs, and accommodation. The number of tourists domestic and abroad has increased by 30% on an annual basis and has created jobs and entrepreneurial opportunities for the local villagers. In 2011, a total of 260,000 tourists visited the village, which generated an operating income of 200 million RMB￥ (US$ to RMB￥: 1–6.2), of which 70 million was sales revenue from agricultural products, with a profit of 20 million RMB￥. The annual per capita income of local residents reached 9,860 RMB￥, a significant improvement in the living standards of the local farmers. However, the question remains how to transform the comprehensive strength of the development of rural tourism in Hekou village. The issue is how to turn rural tourism into an important form of cross-border cooperation that will become a regional growth zone in trans- border cooperation.

2.2. Data collection

(1) Data on environmental background

The environmental monitoring data on the Chinese side of the Yalu River is extracted from the Dandong Environmental Quality Report 2006–2010 (Dandong Municipal Central Environmental Monitoring Station), which includes ecological environmental quality monitoring and evaluation data on climate, plants, soil, and rivers, as well as background information on the natural environment. In addition, data on trans-border cooperation, border security, population, the financial situation, job opportunities as well as a sensitive barometer of socio-economic conditions were obtained by face-to-face interviews and questionnaires. This data formed the basis for the framework of an ANT perspective of rural tourism.

(2) In-depth interview data

Face-to-face interviews and standardized questionnaire interviews conducted with experts and scholars, tour operators, travel management departments, residents of local communities, and tourists give information on their experience and perceptions of the rural landscape, traditional agriculture, the tourism industry, and the participation of community residents. Data related to the construction of a rural tourism actor-network is sorted and summarized, and is the foundation on which the impact matrix is built.

The investigation was performed using pairwise comparisons by asking the question, "How is impact an actor compared with another actor with respect to rural tourism?" The questionnaires in Chinese were entirely related to rural tourism, and they were measured using a four-point scale, with 0 for "no impact," 1 for "weak impact," 2 for "moderate impact," and 3 for "strong impact." Answers 2 and 3 were considered positive. Questionnaires were distributed to 56 (63.6% of total) tourists from various regions, and to 32 (36.4%) of local villagers. Respondents were free to answer the questionnaire anonymously.

We used a scoring method to determine the relationship among all actors to construct an impact matrix. The impact matrix is a tool that helps users remembers the probabilities and impacts of various actors that might occur in the network and affect the other actors. The matrix ranks actors, such as folk customs or protective measures, by evaluating their level of contribution to weighted objectives (Svenson et al., 2007). It ensures that our decision is linked only to the objectives that are fundamental to the decision.

2.3. Analysis of centrality

Centrality is a concept often used in SNA to study different properties of networks modeled in graphs. Centrality refers to how close one is to the center of the network and the number of links required to reach the others critical in the network. Common practice is to utilize the centrality of network actors through measurements of out-degree and in-degree (Freeman, 1979). For in-degree (Eq. 1):

$$n = \sum_{n=1}^{n} z_{mn} \tag{1}$$

Eq. (1) represents the in-degree of p_n corresponding to the n-th column in the impact matrix. For out-degree (Eq. 2):

$$m = \sum_{m=1}^{n} z_{mn} \qquad (2)$$

Eq. (2) calculates the out-degree of p_m corresponding to the m-th row in the impact matrix. Due to the fact that in-degree and out-degree only consider the connecting lines and connecting strength of the direct and adjacent linkages between the points, rather than the number of indirect linkages with these points, degree centrality represents the centrality of the local networks only. Therefore, relying solely on degree centrality is not sufficient to identify the FAs of rural tourism actor-network. It is necessary to analyze the FAs by the closeness centrality method used to measure the distance between actors.

For Closeness Centrality (Eq. 3):

$$C_{AP_m}^{-1} = \sum_{n=1}^{n} d_{mn} \qquad (3)$$

Here, d_{mn} is the shortcut distance between points m and n, representing the sum of the shortest distances from one point to another point, and the sum is a measure independent from others' control (Everett and Borgatti, 2010). A smaller closeness centrality means that the point is closer to the core of the network and therefore more independent from the control of other points. If one point is in a short distance of any other point in the network, this point is considered as having high overall centrality. The key actors playing a controlling or influential role in rural tourism tends to have a direct impact on others, featuring high closeness centrality, less susceptibility to the influence of others, and a low level of in-degree. To determine the FAs in the network, points are usually sampled on the basis of the criteria of high out-closeness centrality and high in-closeness centrality.

2.4. Effect Analysis Diagram

The Effect Analysis Diagram graphically represents the actors calculated by the impact matrix. It is constructed by positioning the actors within a two-dimensional diagram without-closeness centrality shown on the horizontal axis and in-closeness centrality shown on the vertical axis. The diagram is divided into four quadrants representing the classification of the actors. The positions of the values of in-closeness centrality and out-closeness centrality in the diagram reflect their mutual relationship in influencing the dynamics of the tourism network.

The out-closeness centrality sum (row) is a measure of the influence of an individual actor on others in rural tourism actor-network. At the same time, the in-closeness centrality sum (column) is a measure of how much an individual actor is influenced by the others in the same setting.

The grid shown in the diagram shows four sectors that are discussed in Fig. 3. These sectors further define the actors with respect to their in-closeness or out-closeness centrality in the network, and thus enhance both the models' effectiveness and the prevention of negative side effects such as possible mitigation measures.
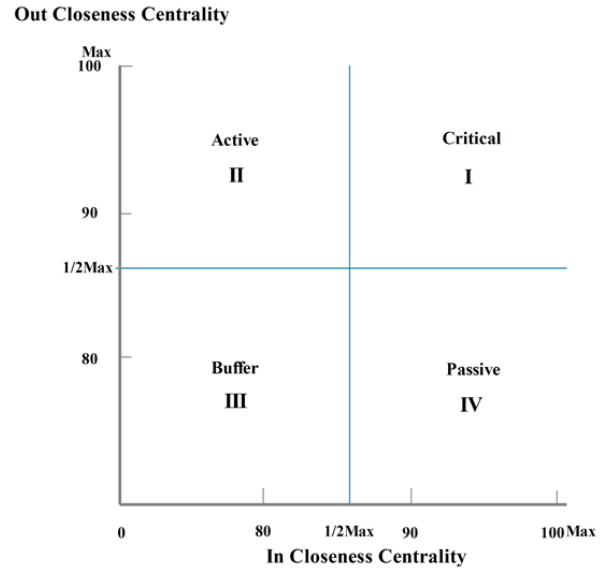

Fig. 3. Actors classification diagram (adapted upon Vester, 2002)

The characteristics of actors in the four quadrants are as follow:
- Critical actors in the first quadrant have a wide influence on other actors and a high level of sensitivity to change in the rural tourism network.
- Critical actors with high in-closeness centrality values are located in the upper right-hand corner of the diagram, while buffering actors (low in-closeness centrality values) are situated close to the origin.
- Critical actors are important operational processes in the network, usually associated with growth and development, and closely coupled with the function of active, passive, and buffer actors. In this study, we use the values of out-closeness centrality and in-closeness centrality to determine the FAs in the translation of rural tourism from an actor-network perspective.
- Active actors in the second quadrant are responsible for driving change and development in the rural tourism network. They have a strong influence on other network actors. From a simple cause and effect perspective, the identification of these network drivers helps us understand the behavioral characteristics of a network.
- Buffer actors in the third quadrant have the capacity to absorb change without drastically altering their own state or that of others in the tourism network. All complex networks go through stages of growth, development, and state of change that adjust the extent and frequency. System buffers provide room for sudden growth and change chokes on one hand, and compensation for lack of growth and change on the other.

- Passive actors in the fourth quadrant are highly sensitive to change and we call these actors variables because of the manner in which they respond to strong influences. Passive actors perform different roles in the rural tourism network. For example, a passive actor may be a stock, which performs an important feedback function for the system (network). Passive actors in the final demand or consumption end of the tourism experience have weak forward influence and thus are not associated with growth processes in the same way as that of critical and active actors.

2.5. Impact matrix and actor-network structure

Using the impact matrix for a correlation analysis of network actors is an important step in building an actor-network relationship. The purpose of a correlation analysis is to examine the relations between the actors of rural tourism in a systematic way. A network analysis matrix is established using the association data collected by observation, analysis, and in-depth interviews. This network analysis matrix is also known as an impact matrix. The values in the matrix represent the impact of each row of elements on each column of elements. It is also a data matrix reflecting "actor–actor" relationships. A 0–3 four-point scoring system is designed to determine the in-degree and out-degree of the actor on the basis of expert assessment and intensity of the impact of one actor on another. Habitat Conditions (HC), for example, has a strong impact on Traffic Conditions (TC) and therefore scores 3 in the impact matrix (Table 1).

On the basis of the impact matrix above, the SNA software Net draw is used to draw a visual diagram. It shows that nodes (i.e., actors) of rural tourism based on an actor-network perspective are closely linked and the actor-network has a certain degree of cohesion, where most of the actors are connected to each other so that no one can escape without being noticed by others. This relationship builds up trust and social control between the members in the network. The actor in the center of the network somehow dominates other actors, resources, and all types of relationships and serves as the FA in the translation of the actor-network.

Fig. 4 represents the link between direct and indirect relationships between actors with respect to their direction and intensity.

In the diagram representing direct links, it was located at the same place as the others actors Link to Environmental Quality. The most significant influence has been identified between the actors: Traditional Food, Link to Leisure Services, and Activity Participation. This corresponds to the diagram of influence and dependence, where these four actors are both the most influential and the least dependent.
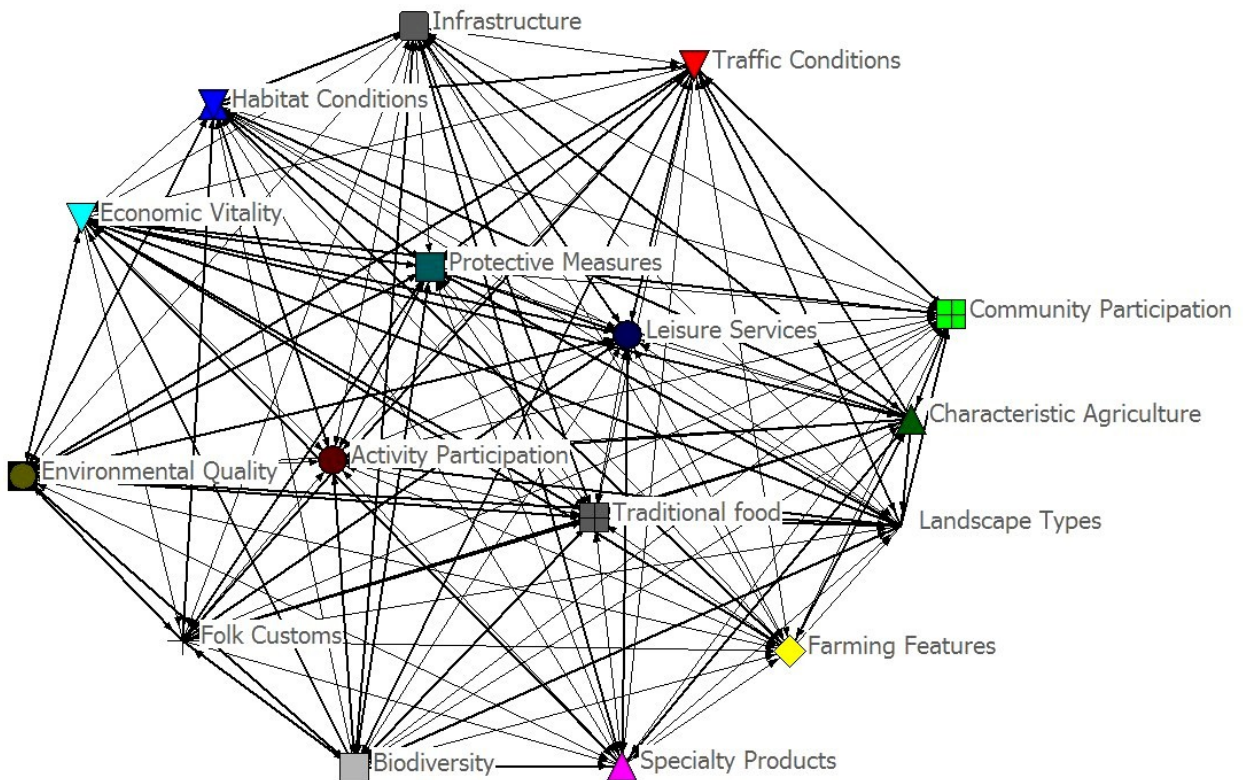

Fig. 4. Rural tourism actor-network visualization structure

Table 1. Rural tourism actor-network impact matrix

Network Dimension	Rural Society				Agricultural Industries					Tourism Activity			Agro-ecological Environment				In-degree (ID)
Actors	Traffic Conditions (TC)	Habitat Conditions (HC)	Folk Customs (FC)	Infrastructure (IN)	Specialty Products (SP)	Characteristic Agriculture (CA)	Community Participation (CP)	Economic Vitality (EV)	Farming Features (FS)	Traditional food(TF)	Activity Participation (AP)	Leisure Services (LS)	Environmental Quality (EQ)	Landscape Types(LT)	Biodiversity (BI)	Protective Measures (PM)	
TC		3	3	2	0	3	3	0	2	2	2	3	0	3	3	3	32
HC	3		2	3	1	3	0	0	1	2	3	2	1	2	2	3	28
FC	3	3		1	0	1	2	2	2	3	2	2	3	2	3	3	29
IN	2	0	2		3	3	1	1	2	3	1	3	0	1	3	1	26
SP	1	1	2	1		3	2	2	1	2	1	1	1	1	3	2	23
CA	0	0	3	2	1		3	1	3	1	0	0	0	0	2	1	17
CP	3	1	0	1	1	3		3	2	2	2	2	0	3	2	1	23
EV	1	1	0	2	3	3	3		3	2	1	3	1	3	3	3	32
FS	2	3	2	2	1	1	1	1		0	1	1	2	0	1	2	18
TF	1	2	1	1	2	2	1	3	2		1	2	3	2	3	2	28
AP	2	1	1	2	2	3	1	2	1	2		1	2	3	3	3	27
LS	2	2	3	1	3	2	1	1	2	1	1		1	2	2	3	27
EQ	3	3	1	2	2	2	0	3	1	3	1	3		0	3	3	27
LT	2	2	1	2	2	3	0	0	2	3	2	2	3		3	2	29
BI	2	0	3	2	1	2	0	0	-	2	3	2	1	2		3	21
PM	2	1	2	1	2	2	1	1	1	2	2	3	2	3	3		28
Out-degree OD	29	23	23	25	24	36	16	20	23	30	21	30	20	27	36	32	

Note 1 : 0 means no impact, 1 means weak impact, 2 means moderate impact, and 3 means strong impact. This is a non-symmetric directed graph matrix; Abbreviation OD represents out-degree, abbreviation ID represents in-degree.

Table 2. Actor-network centrality analysis of rural actor-network

Evaluation of Actors	Closeness Centrality (%)							
	Active		Critical		Buffer		Passive	
	OUT>93.7	IN<94.4	OUT>93.7	IN>94.4	OUT<93.7	IN<94.4	OUT<93.7	IN>94.4
Traffic Conditions	93.8	83.3						
Habitat Conditions	93.8	88.2						
Infrastructure	100	93.8						
Characteristic agriculture	100	83.3						
Farming Features	93.8	93.8						
Environmental Quality	93.8	93.8						
Landscape Types	93.8	88.2						
Biodiversity	100	93.8						
Traditional Food			100	100				
Activity Participation			93.8	100				
Leisure Services			93.8	100				
Protective Measures			100	100				
Folk Customs					88.2	93.8		
Community Participation					83.3	93.8		
Economic Vitality					83.3	93.8		
Specialty Products							88.2	100
Degree of Overall Network Centrality	Network out-centralization =13.9%; Network in-centralization =13.9%							

Source: UCINET6.0 operation, 2012; OUT: out-degree; IN: in-degree; IN Mean value=94.4; OUT Mean value=93.7

3. Results

The UCINET 6.0 software used to calculate the network's closeness centrality refers to how close one is to the center of the network, and the number of links required to reach critical others in the network. The indices of closeness centralities are classified into 4 types according to the values of out-closeness and in-closeness centrality of actors in the actor-network. The actors with relatively high out-closeness centrality (>0.937) and high in-closeness centrality (>0.944) determine the FAs in the network translation process (Table 2). FAs are selected from each of the four dimensions of rural society, rural agriculture, leisure experience, and ecological environment. They are Traditional food, Activity Participation, Leisure Services, and Protective Measures respectively. These four FAs play an important role in translation for the construction of the actor-network, which concentrate on aspects of tourism activity and the dimension of agro-ecological environment. This also means that these FAs are able to take credit for the successes achieved within the rural actor-network, as outside actors are able to bypass its control and influence the rural actor-network directly.

As shown in Table 2, rural tourism actor-network in-centralization and network out-centralization both stand at 13%, indicating that the actor-network resources used in the sample are unlikely to be controlled or dominated by any individual actor and the relationships between the actors are dispersed and scattered. It also indicates that the FAs in the actor-network are highly unlikely to be

replaced by other actors with the same status and thus play an equal role in tourism development.

4. Discussion

(1) Sociologically, the identification of FAs in particular focuses on the relational aspects of the actors and how the cohesion of the actor-network may foster tourism development in a rural area. Geographically, the identification of the FAs helps turn the actor-network into an ecological experiential landscape that is integrated with human and natural elements such as climate, biodiversity, soil, and topography. In ecological economics, the identification of the FAs helps turn the actor-network into an innovative agro-ecosystem capable of self-organizing, which improves the harmonious development of natural resources, human capital, technology, and information in a continuous cycle of self-organization. In tourism economics, the identification of the FAs helps turn the actor-network into a tourism destination site that connect the urban and rural areas more closely, and this in turn, transforms the villages in the border zone into a sound regional economy with multi-functional agricultural systems. How to couple points of view in the practice for translation processes of rural tourism actor-network still needs a better understanding of the characteristics of FAs.

(2) The empirical case study is developed to suggest some innovative ways in which the ANT could contribute, and complement, to extant theories of integrated rural tourism and multi-functional

landscape. The identification of FAs is also an enormous opportunity to introduce sustainable technologies and practices on a rural landscape scale. To a certain extent, identification of FAs works like an open self-organizing agro-ecosystem that is capable of self-adjusting in a rural space, or a multi-functional landscape. The convergence of such factors in multi-functional landscape has integrated human activity and landscape configuration into the ecological fabric of maintaining an ecosystem function, service flows and biodiversity retention.

When rural regulatory mechanisms are at work in this multi-functional landscape, the status of the FAs in the translation process may change as well. The status of the original FAs starts to decline, and the status of new FAs starts to rise. When this occurs, their roles of rural tourism actor-network also change. In spite of the changes that may come along, they will replicate themselves in the rural areas to achieve their own objectives, similar to the replication of Deoxyribonucleic acid (DNA), until a new dynamic actor-network is constructed. The multi-functionality of rural tourism and food production calls for multidisciplinary research and an innovative approach.

5. Conclusions

(1) The framework constructed an innovative space for rural tourism. The identification of the FAs in relation to the OPP is the key to the success of the translation process in the construction of rural tourism actor-network. The FAs are the driving force pushing forward the development of integrated rural tourism, and they tend to be positioned in the center of the translated network, influencing others while also being affected by other actors. Such FAs can be identified using the closeness centrality indices that combine materials with organizations and institutions in the development of rural tourism, followed by a transition process that facilitates the convergence of agriculture and tourism in cross-border cooperation. The transitional network strategy is a sustainable way for rural tourism development, which integrates agro-ecological environment, rural products, rural society, and stakeholders. These actors are fused together in an innovative space and in an innovative way, which further promotes the role of rural tourism in the sustainable development of multi-functional agriculture.

(2) The translation process forms a comprehensive effect for improving the quality of multi-functional landscape. The translation is essentially the conversion of the actors' power in the construction of rural tourism actor-network. Through the development of traditional food, activity participation, leisure services, and protective measures, the construction of rural tourism actor-network contributes to urban–rural integration and cross-border tourism activity including the construction of a cross-border free-trade zone. These processes will turn the rural landscape of the border zone into capital resources through tourism-oriented integrated rural development.

The combination of other innovative actors will transform traditional farming into multi-functional agriculture that enhances the values of multi-functional landscape. Bringing together the rural ecosystem service on both sides of the Yalu River can turn the border elements into an ecological-experiential-landscape with high biodiversity and a broad potential space for rural development. Therefore, the construction of rural tourism actor-network will turn a traditional landscape into multi-functional landscape, which in turn promotes the extensive participation of rural communities.

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