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The impact of tourism on agriculture in Lugu Lake region

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Key words: Tourism, agriculture, Lugu Lake

SUMMARY

Tourism has had some significant effects on local agriculture as well as the economy and environment in the Lugu Lake area because it has developed so rapidly. This paper analysed the effects of tourism on two villages at different locations. Tourism did not have an obvious impact on agriculture in the village near a tourism hot spot because it has tourism administrators who have developed culture-protecting management measures so that this village still retains its original agricultural processes and structure. In contrast, the village that is marginal to the tourist area has suffered more significant impacts from tourism. Although this latter village is far from the hot spots it has taken advantage of its ability to combine agriculture and tourism. Such villages are trying to grasp the opportunities brought by tourism through measures to optimise their agricultural structures in order to achieve harmonious changes that can improve the living conditions of local inhabitants.

INTRODUCTION

Since the 1990s, with the development of China's reforms and opening-up, people's living standards have substantially improved. Tourism in China has also seen unprecedented development driven by the government's policies that encourage consumption. Tourism impacts local economies and the environment (Loumou *et al.* 2000; WTO 1983; Butler 1991). The development of tourism can impact economic activities by providing more job opportunities, funding for infrastructure and optimising industrial structures. On the other hand, negative impacts from tourism will occur when the level of visitor use is greater than the environment's ability to cope within acceptable limits of change. Tourism can put enormous pressure on an area and lead to impacts such as soil erosion, increased

pollution, discharges into the sea, natural habitat loss, increased pressure on endangered species and heightened vulnerability to forest fires (OECD 1980; Jim 2000). As one of the keystone tourism provinces in China, Yunnan Province has rich tourism resources and attracts numerous domestic and overseas visitors because of its natural scenery and folk customs. Since most resorts are located in rural areas, tourism development may impact local agricultural production as well as the local economy and environment.

There is controversy over whether tourism development affects local agriculture. Tourism development can provide more non-farm job opportunities for farmers, increase the sale of specific local agricultural products (Torres 2003; Mjalager 1996),

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increase income from tourism activities, provide farmers with secondary funding to continue their agricultural activities, while modifying agricultural structures to meet tourism developments. Hence, agriculture can benefit from tourism development. Considering the seasonal character of the tourism industry and of agricultural production, the linkage between tourism and agriculture is weak (Loumou 2000; Cox 1995). Because tourism and agriculture compete for labour and land, tourism development can have a negative impact on local agricultural production (Cox 1995).

There are several questions related to tourism development in the Lugu Lake region: how will it impact local agriculture; how are tourism and agriculture related; and is tourism in harmony with local agriculture? Focusing on these questions, two representative villages, Luoshui and Yongning, were selected for study. Luoshui is near Lugu Lake, in the centre of the resort area and is directly affected by visitors. Yongning is far from Lugu Lake and is only indirectly affected by visitors, since most resorts are near the lake and most visitors are from the adjoining zone. The aim of this paper is to examine the mechanisms of the impact of tourism on local agriculture by comparing changes in agriculture in the two villages, to provide a theoretical basis for harmonious development of tourism and agriculture in this rural area.

STUDY AREA AND DATA RESOURCES

Study area

Lugu Lake is a body of water in the mountains (2690 m) between Yunnan and Sichuan Provinces in southwest China, known for its peculiar natural scenery and the unique culture of the Mosuo people. The annual mean precipitation and temperature are 1000 mm and 12.8°C (Yunnan Academy of Forest Planning and Design 1989). The Mosuo people have a matriarchal system that is still

alive today and is unique in China (He 2001). Women are the leaders of the community's extended families, and all family members are descendants of the same woman. There are no husbands, and fathers meet their women at night but live separately with their own mother's families by day. Tourism has grown rapidly, stimulated by the local government policy to encourage natural and cultural tourism development. Consequently, tourism income has also increased with increasing visitor numbers (Table 1).

Data resources

Agricultural data (1990–2003), including total population, agricultural population, total arable land area, planted area, food production, vegetable area, fruit production, livestock composition and production, was provided by the Yongning village government. Visitor number and tourism income (1995–2004) were provided by the Supervision and Administration Commission of Lugu Lake.

RESULTS

Changes in agricultural population of the Lugu Lake region

Table 2 lists the total population, agricultural population and the ratio of agricultural population to total population of Luoshui and Yongning from 1990 to 2003. The population involved in agriculture has increased in both villages. The ratio shows an increasing trend for Luoshui; however, the rate of increase has been slow, only increasing by 5% in 14 years. The trend is similar for Yongning and has increased by 12% since 1990. The greatest increase occurred in 2002 and has increased by 25% in the last 10 years. In addition, the average annual rate of increase of the agricultural population for Yongning (2.5%) was significantly higher than that of Luoshui (0.87%).

Table 1 Visitor numbers and the total income from tourism in Lugu lake region (1995–2004)

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Visitor number	82600	91000	150000	209600	214000	231400	237000	250000	250000	202453
Tourism income (10 ⁴ yuan (RMB))	–	–	2835	3195	6130	6960	7100	7300	7500	–

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Table 2 Changes (%) in the agriculture population in Luoshui and Yongning near Lugu lake (1990–2003)

Year	Luoshui			Yongning		
	Total population	Agricultural population	Agricultural/total population	Total population	Agricultural population	Agricultural/total population
1990	2656	1210	45.6	5729	2551	44.5
1991	2687	1256	46.7	5827	2710	46.5
1992	2742	1274	46.5	5880	2836	48.2
1993	2771	1328	47.9	5904	3109	52.7
1994	2776	1344	48.4	5936	3095	52.1
1995	2794	1341	48.0	5999	2872	47.9
1996	2854	1338	46.9	6032	2816	46.7
1997	2873	1344	46.8	6052	2800	46.3
1998	2912	1354	46.5	5895	2592	44.0
1999	2925	1460	49.9	5940	3443	58.0
2000	2913	1472	50.5	5932	3556	59.9
2001	2936	1508	51.4	6290	3598	57.2
2002	2974	1513	50.9	6302	4402	69.9
2003	3022	1535	50.8	6403	3596	56.2

Changes in planting regimes

Table 3 lists changes in planting area of different crops in Luoshui and Yongning from 1990 to 2003. The food crop ratio for Luoshui increased by 5% in 14 years. In contrast, the food crop ratio for Yongning declined after 1996, from about 97% between 1990 and 1995 to 70.4% in 2002. Production of economic crops in Yongning declined but there were no obvious changes in Yongning, apart from the years 1994, 1997 and 2004. Vegetable production for Luoshui fluctuated greatly and declined overall. For Yongning, vegetable production increased by 4% from 1990 to 1996, and 4.4% in 2000. Comparing changes in total arable land area, total planting area and cropping index of the two villages, there was no obvious change in arable area and efficiency of land use in Luoshui, which were maintained at a steady level from 1.3 to 1.4. In Yongning, succession cropping was not adopted before 1995 and land utilisation efficiency was very low. Since 1997, land utilisation efficiency has increased gradually, with arable land area decreasing, and the cropping index reached 1.6 in 2003 (Table 4).

In general, there is a significant difference in crop structure between Luoshui and Yongning. From 1990 to 2003, food crop production increased, while economic crops and vegetable production decreased in Luoshui. In Yongning, food crop production decreased while economic crop and vegetable production increased.

Changes in fruit production

The main fruit products of the Lugu Lake region are apples, pears, lichees and Chinese dates. Peach and grape were also cultivated after 2000. Table 5 lists changes in fruit production of Luoshui and Yongning from 1990 to 2003, where production increased in both villages. In Luoshui, increases in fruit production can be divided into two periods: before 1996 fruit production was low (6×10^4 kg) and then increased gradually. In Yongning, fruit production showed great fluctuations, gradually increasing, but with a notable decrease in 1996 and 1998, reaching 1.9×10^5 kg in 2003. To better understand fruit production in the Lugu Lake region, we also compared production of different fruits for the two villages. For Luoshui, the production of apples increased from 38.9% in 1993 to 54.9% in 1994, while pears and other fruits decreased from 44.8% in 1993 to 31.5% in 1994. For Yongning, changes in fruit production were not as obvious and showed great fluctuations.

Changes in the livestock industry

Table 6 gives livestock numbers for Luoshui and Yongning. The number of pigs and horses and ratio in Luoshui increased, while other livestock decreased. There was significant growth in fowl and egg production after 1990, with fowl production increasing from 2000 kg in 1990 to 8000 kg in 2003 and 1.4×10^4 kg in 2004. At the same time, milk

Table 3 Planting areas of different crops (%) in Luoshui and Yongning (1990–2003)

Year	Luoshui			Yongning		
	Food crop	Economic crop	Vegetable	Food crop	Economic crop	Vegetable
1990	88.96	2.90	3.62	96.97	0.23	2.01
1991	88.96	2.90	2.72	96.97	0.23	2.01
1992	87.12	3.00	3.53	96.97	0.23	2.01
1993	0	2.71	0.00	0	0	3.20
1994	90.78	2.77	2.77	96.97	0.90	2.01
1995	90.78	2.77	2.77	96.97	0.23	2.01
1996	89.13	2.72	4.53	89.34	0.28	1.96
1997	89.03	2.74	4.57	94.85	0.95	2.37
1998	88.98	2.73	4.52	83.14	0.29	3.28
1999	91.94	2.34	4.71	88.20	0.11	4.22
2000	91.93	2.33	4.76	88.40	0	4.42
2001	90.96	2.12	0.96	87.95	0	4.38
2002	94.60	1.74	1.39	70.40	0	3.73
2003	94.13	1.80	1.73	76.66	4.74	3.91

Table 4 Changes in planting area (10⁴ m²) in Luoshui and Yongning

Year	Luoshui				Yongning			
	Total arable area	Total planted area	Cropping index	Arable area per capita	Total arable area	Total planted area	Cropping index	Arable area per capita
1990	259	368	1.42	0.10	1004	1004	1	0.18
1991	259	368	1.42	0.10	1004	1004	1	0.17
1992	259	378	1.46	0.09	1004	1004	1	0.17
1993	259	369	1.43	0.09	1004	1004	1	0.17
1994	259	361	1.39	0.09	1004	1004	1	0.17
1995	259	361	1.4	0.09	1004	1004	1	0.17
1996	258	368	1.43	0.09	1004	1188	1.18	0.17
1997	258	365	1.41	0.09	943	1125	1.19	0.16
1998	258	354	1.37	0.09	943	1281	1.36	0.16
1999	258	343	1.33	0.09	941	1193	1.27	0.16
2000	259	343	1.32	0.09	941	1207	1.28	0.16
2001	259	347	1.34	0.09	941	1217	1.29	0.15
2002	259	383	1.48	0.09	941	1520	1.62	0.15
2003	258	370	1.43	0.09	941	1407	1.5	0.15

production decreased significantly. In Yongning, pig production decreased, while other livestock increased. Fowl, egg and milk production showed similar growth.

DISCUSSION

Impact of tourism on the agricultural population

Agricultural populations of both Luoshui and Yongning have increased with tourism

development. Compared to Yongning, the growth of the agricultural population in Luoshui was relatively low. Luoshui is located in the central zone of the resort, attracting more local people to engage in tourism, which may explain the low growth in the agricultural population in Luoshui. In order to conserve local culture and prevent harmful competition, the local government has managed tourism development systemically. The local government assigned a certain number of people from each local family to tourism activities and tourism income is allotted by the administration commission of the

Table 5 Variation in total fruit production (kg) and planting (%) in Luoshui and Yongning (1990–2003)

Year	Luoshui				Yongning			
	Total fruit production	Apples	Pears	Other fruits	Total fruit production	Apples	Pears	Other fruits
1990	44500	36.0	48.3	15.7	66240	34.0	30.9	35.0
1991	61100	40.9	43.7	15.4	74250	24.8	33.7	41.5
1992	63200	45.1	39.9	15.0	104750	39.8	30.5	29.6
1993	64700	38.9	44.8	16.2	125600	26.4	39.6	33.9
1994	79200	54.9	31.6	13.5	151750	38.7	27.3	32.2
1995	95200	60.4	27.3	12.3	118300	39.6	21.2	37.3
1996	162700	73.8	18.4	7.8	167520	53.9	16.4	29.7
1997	183400	71.4	21.8	6.9	172890	51.4	19.0	29.5
1998	167700	72.2	20.9	7.0	175100	54.4	18.7	26.8
1999	158700	70.6	22.1	7.4	121300	75.3	0	24.7
2000	168500	72.4	20.8	6.8	129600	71.5	5.0	23.5
2001	179000	72.6	20.9	6.4	129400	59.9	8.2	8.0
2002	192000	74.5	19.5	5.9	176200	46.7	5.7	25.7
2003	127800	66.1	29.7	4.1	190500	40.9	5.7	48.1

Table 6 Livestock numbers and changes in husbandry (%) in Luoshui and Yongning (1990–2003)

Year	Luoshui					Yongning				
	Total no.	Cattle	Horse	Pig	Sheep	Total no.	Cattle	Horse	Pig	Sheep
1990	6986	13.2	6.7	54.9	25.2	13602	11.6	10.5	67.7	10.2
1991	5620	16.2	8.5	60.7	14.5	13089	11.9	11.0	68.8	8.4
1992	6442	14.7	7.8	54.7	22.9	15336	11.5	10.3	67.8	10.5
1993	–	–	–	–	–	–	–	–	–	–
1994	7156	13.8	7.2	57.7	21.4	15981	11.3	10.3	67.9	10.5
1995	7287	13.7	7.1	57.4	21.8	10917	13.3	17.6	52.9	16.3
1996	7220	13.1	7.5	58.4	21.0	11317	12.5	15.8	57.4	14.3
1997	7261	13.2	7.5	58.2	21.0	11622	12.3	15.0	55.7	17.1
1998	7159	13.7	7.8	60.7	17.8	11974	12.3	14.5	57.9	15.3
1999	7185	13.6	7.8	60.8	17.8	11699	12.9	15.1	56.4	15.7
2000	7389	13.0	7.7	61.1	17.7	11544	13.5	15.2	55.0	16.3
2001	6848	14.8	8.4	64.7	12.2	10454	14.4	16.4	51.3	18.0
2002	6239	9.2	7.2	70.5	13.1	9268	16.4	18.5	48.4	16.7
2003	6054	9.6	7.6	67.2	15.6	9593	13.4	16.9	53.5	16.2

resort. These practices control the number of people engaged in tourism activities, which helps to conserve the local cultural traditions and prevents invasion of exotic cultures. Since Yongning is far from the central zone of the resort, the agricultural population in this village was less affected by tourism development than that of Luoshui. The growth of the agricultural population was higher than that of Luoshui, suggesting that agriculture is still the keystone industry in this village.

Impact of tourism on crop planting

Both Luoshui and Yongning showed a similar trend in food production (Table 4). Since food crop production is mainly controlled by the local climate, soil conditions and production level, food crop production was less directly affected by tourism development. Tourism may lead to adjustments to crop planting structure. In Luoshui, the food crop production increased steadily with production of

economic crops decreasing. However, food crop production decreased, while economic crop production increased in Yongning. Luoshui is near the lake and has less arable land, and the quality of arable land in the village is relatively low, most having on high slopes ($> 15^\circ$). However, Yongning has relatively flat topography and more high-quality arable land which is favourable for maintaining higher crop productivity (Table 4). These differences between the two villages may explain the variations in planting structure. The ability of these villages to produce food only meets the requirements of local people. With increasing visitor numbers, some foods and vegetables are now imported to meet visitor requirements. Because of the local government's policy for conserving cultural characteristics and living habits, agriculture in Luoshui was less affected by tourism development. Yongning is far from the main resort and has unique crop production, and the local government allows Yongning village to supply food to the resort. Consequently, agricultural practice was affected by tourism development. Agricultural practices for increasing economic crops, local products and efficiency of arable land use help in the development of crop production and agricultural products in response to the special needs of the growing tourism industry; consequently, local communities have obtained high value from diversified agricultural products, leading to increased incomes and living standards (He 2001, 2002).

Impact of tourism on fruit production

In 1996, high-quality apple varieties were introduced into Luoshui, and apple production was greatly improved, which can explain the obvious growth in apple production after 1996. There was also a significant increase in visitors who preferred to buy local apples, which further contributed to the growth of apple production. However, fruit production in Yongning fluctuated, and after 2000, production of other high-value fruits, such as peaches and grapes, increased, suggesting that farmers in Yongning had successfully adjusted their fruit planting structure and improved fruit diversity in response to the tourism development.

Impact of tourism on the livestock industry

The livestock industry in Luoshui showed a trend similar to plant production. Pig raising dominated the livestock industry in this village. With increasing visitor numbers, the demand for pork, chicken and eggs also increased. The most significant growth in fowl production occurred in 1995, reaching 1×10^4 kg and associated with the growth in visitor numbers. Since horse-riding is an important local tourism activity, tourism development also stimulated horse raising. The increase in people engaged in tourism led to a decline in milk production in Luoshui because labour became scarce. The situation in Yongning differed, and pig production declined, while production of cattle, horses and sheep increased, suggesting that these farmers had also adjusted to the needs of the tourism industry by diversifying into high-value livestock products. In order to harmonise development it is necessary to adapt agricultural development to tourism by optimising agricultural structure (Qiu 2005).

CONCLUSION

Agriculture in the Lugu Lake region showed different responses to tourism development at the two different locations, and the impact of tourism also varied with location. The area near the resort, Luoshui, was directly affected by tourism development: agricultural growth declined because more people were engaged in tourism activities and farmers adjusted to the needs of the tourism by diversifying into high-value agricultural products. In the rural area far from the resort, Yongning, the impact of tourism on agriculture was limited and tourism indirectly impacted agriculture mainly through optimising agricultural structure (Loumou 2000; Aliza and Anat 2005). In Yongning, the agricultural population increased steadily, the arable land-use efficiency greatly improved and diversified into high-value products in response to tourism development (Qiu 2005; Yan and Li 2004).

The relationship between tourism and agriculture should be mutually beneficial (OECD 1980). Agriculture supplies basic products to meet the needs of growing tourism development and

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tourism provides farmers with supplementary funding to optimise agricultural structure and continue agricultural activities (Coccossis and Parpairis 1995). In the Lugu Lake region, the local government has harmonised the development of tourism and agriculture. One part of tourism income is given as an allowance to farmers from the central zone of the resort, to encourage them to participate in tourism activities and conserve their cultural characteristics and life style. Another part of income from tourism is used to optimise agricultural structure and specific agricultural development for the area far from the resort

(Loumou 2000; Qiu 2005). However, there is still much work required to understand how to harmonise agriculture and tourism for the long term.

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