A Study on "Internet +" Eco-production and Eco-tourism Mode for Agricultural Enterprises

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Abstract "Internet +" eco-production and eco-tourism carried out by agricultural enterprises is one of ways to increase income. Urban economic development index evaluation value (u_1), agricultural enterprises' eco-production and eco-tourism index evaluation value (u_2) and Internet popularity index evaluation value (u_3) constitute the ternary coupling system. The ternary coupling coordination degree (D_3) combined with u_2 can be used to judge whether the agricultural enterprises practise eco-production and eco-tourism mode. When $u_2 \geqslant 0.5000$, $D_3 \geqslant 0.6000$, the autonomous mode for agricultural enterprises can be used; when $0.4000 \leqslant u_2 < 0.5000$, $0.5000 \leqslant D_3 < 0.6000$, the mode of cooperation with travel agency can be used; when $0.3000 \leqslant u_2 < 0.4000$, $0.4000 \leqslant D < 0.5000$, the tourism business transfer mode can be used; when $u_2 < 0.3000$, $D < 0.4000$, the tourism business should not be carried out. All the above four modes require "Internet +".

Key words Agricultural enterprises, Eco-production and eco-tourism, Internet +, Ternary coupling coordination

1 Introduction

Agricultural enterprises are generally small businesses, with low profits, greatly affected by market, climate and other factors. In addition, agricultural enterprises also have the following characteristics. The agricultural enterprises are mostly located in peri-urban areas, their products are provided to meet urban life demand, with good transportation and communication conditions. The agricultural enterprises occupy a large area, and enjoy good natural conditions. Generally, the breeding and farming enterprises occupy a large area, which can provide environmental conditions for many tourists to visit and participate in production activities. The agricultural enterprises have a close economic collaboration relationship with local farmers, rent land, forests or ponds; or hire local farmers; or cooperate with village and township to form a stock company. There is a high vacancy rate in rural houses. Rural housing area is large, leaving a small population in the family. After being slightly transformed, the vacant houses can be rent to tourists at a very low price. The seasonal labor and idle labor in agricultural enterprises can provide some of the services for tourism. The above features determine that the agricultural enterprises can carry out a new mode of tourism — agricultural enterprises' eco-production and eco-tourism. According to Changsha agricultural enterprises statistics in 2015[1], there were 32 food growers, 10 vegetable planting companies, 8 tea planting companies, 112 livestock breeding companies, 41 poultry breeding companies and 8 special breeding companies around Changsha, all having the above characteristics. The resource conditions of agricultural enterprises, degree of urban economic development and degree of Internet popularity interact with each other to form a ternary coupling body. The degree of coupling coordination can provide a quantitative benchmark for agricultural enterprises, and a judgment rule for the agricultural enterprises to carry out this work.

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2 Urban economic development index evaluation value (u_1)

The urban economic development index evaluation value (u_1) involves a plurality of secondary index evaluation parameters concerning urban travel[2-3]. In order to highlight the relationship between urban economic development and agricultural enterprises' eco-production and eco-tourism, this paper selects four secondary evaluation indices: urban per capita GDP (C_{11}); urbanization rate (C_{12}); per capita disposable income of urban residents (C_{13}); urban road network density (C_{14}). Taking Changsha City for example[4], the four secondary index evaluation values (2008 -2013) can be shown in Table 1. The secondary weightis calculated using standard deviation method[2], the dimensionless processing is first performed on C_{11}, C_{12}, C_{13}, C_{14}, and the non-dimensional valueis calculated (Table 1). The primary dimensionless index evaluation value u_1 during 2008 -2013 is calculated as follows:

$$u_1(\text{Year}) = \sum^{i} \alpha_{1i} \mu_{1i}(\text{Year}) \tag{1}$$

3 Agricultural enterprises' eco-production and eco-tourism index evaluation value (u_2)

Agricultural enterprises' eco-production and eco-tourism specifically refers to the process of visiting in the agricultural production and processing enterprises, participating in the production, leasing part of the agricultural materials and harvesting the corresponding agricultural products. There are 5 secondary index evalu-

ation items to attract tourists. (i) Resource quality (Z_{21}). There are good natural environment resources and rich rural features. (ii) Enterprises' product orientation (Z_{22}). The agricultural products produced by agricultural enterprises can meet urban residents' green food requirements and make the tourists all or partly participate in the farm activities, the production process can inspire the interest for watching and learning, and the products can be harvestable in the late period. (iii) Location conditions (Z_{23}). It is within 120 km from the city, the public transportation is convenient and it takes 2 h self-driving. (iv) Farmers' participation level (Z_{24}). The local farmers are the protectors of the beautiful environment and also the servers of eating, living and buying in the eco-production and eco-tourism. (v) Tourist market value evaluation index value (Z_{25}). Agricultural enterprises' eco-production and eco-tourism is directed at the group aged 30 – 50 years, and most of them were born in rural areas. They achieve success in the city, hoping to bring children to return to agricultural ecological production. At the same time, the harvest of green food is also important for family life. The specific data about the above five items are difficult to collect, and the information is difficult to accurately quantify. The number of ★ is used to represent the index evaluation level and ★★★★★ means the full score of 1[5]. The subjective assignment method is also used for the secondary weight (α_{2i}) of agricultural enterprises. Taking Changsha Jinjing Tea Factory for example, it has 133.3 ha tea plantations and the enterprise is 50 km to the east of Changsha City, adjacent to Pingjiang County and Liuyang County, with convenient transportation and communication facilities as well as beautiful natural environment. Visitors can participate in the whole process of picking and making tea, and bring the high quality tea products home. The secondary index evaluation can be shown in Table 2. According to formula (1), the primary dimensionless index (u_2) of agricultural enterprises' eco-production and eco-tourism for Changsha Jinjing Tea Factory is calculated to be 0.35.

Table 1 Primary and secondary index evaluation value and secondary weight of Changsha's urban economic development during 2008 – 2013

	2008	2009	2010	2011	2012	2013	Secondary weight α_{1i}
C_{11} (yuan/person)	50336.00	56620.00	66443.00	79530.00	89903.00	99570.00	0.2233
C_{12} (%)	61.25	62.63	67.70	68.47	69.40	70.60	0.2431
C_{13} (yuan/person)	18282.00	20864.00	23347.00	27069.00	31044.00	33662.00	0.2490
C_{14} (km/100 sq km)	98.91	101.00	129.51	42.33	150.44	159.52	0.2846
u_1 (primary dimensionless value)	0.00	0.11	0.46	0.66	0.83	1.00	

Table 2 The eco-production and eco-tourism index evaluation and secondary weight for Changsha Jinjing Tea Factory

	Level	Evaluation score	Secondary weight α_{2i}
Z_{21}	★★★	0.6	0.3
Z_{22}	★★	0.4	0.2
Z_{23}	★★	0.4	0.1
Z_{24}	★	0.2	0.3
Z_{25}	★	0.2	0.3

4 Internet popularity index evaluation value (u_3)

China is entering the era of the Internet +, and the new agricultural enterprises' eco-production and eco-tourism needs the Internet as medium. Agricultural enterprises use the online booking travel sites for multilateral exchanges with tourists, and the Internet is needed for fund and tourism management, tourism promotion or service supervision. The Internet popularity index evaluation value (u_3) has multiple secondary indices. This article only selects the number of Internet users related to tourists (F_{31}) and the number of domain names associated with agricultural enterprises (F_{32}) as index. Table 3 shows the secondary index value and secondary weight (α_{3i}) of Internet popularity[6]. The subjective evaluation method is used for the secondary weight. The calculation of u_3 is the same as that of u_i.

Table 3 The secondary index value and secondary weight (α_{3i}) of Internet popularity

	2008	2009	2010	2011	2012	2013	Secondary weight
F_{31} (10^8 persons)	2.99	3.38	4.42	4.85	5.38	5.91	0.7000
F_{32} (10^4)	1485.00	1626.00	1121.00	866.00	873.00	1470.00	0.3
u_3	−0.05	0.39	0.46	0.44	0.52	0.63	

5 The coupling coordination degree between urban economic development and agricultural enterprises' eco-production and eco-tourism in the era of Internet +

The three primary index evaluation values of urban economic development, agricultural enterprises' eco-production and eco-tourism, and Internet (u_1, u_2, u_3) constitute the ternary coupling system. The coupling degree (C_n) and coupling coordination degree (D_n) are used to express the degree of interaction. The coupling degree (C_n) between n interacting systems is calculated:

$$C_n = \{(u_1 \times u_2 \times \cdots u_n)/[\prod(u_i + u_j)]\} \quad (2)$$

The coupling degree (C_2) of the binary system[3, 7–8] is calculated:

$$C_2 = \{(u_1 \times u_2)/[(u_1 + u_2) \times (u_1 + u_3]\}^{1/2} \quad (3)$$

The coupling degree (C_3) of the ternary system is calculated:

$$C_3 = \{(u_1 \times u_2 \times u_3)/[(u_1 + u_2)^2 \times (u_1 + u_3^2 \times (u_2 + u_3)^2]\}^{1/3} \quad (4)$$

To prevent the high coupling distortion of u_n value in the low-value region, the coupling coordination degree (D_n) is introduced in practice.

$$D_n = \sqrt{C_n T_n} \quad T_n = \sum^{i} \alpha_i u_i (\sum \alpha_i = 1) \quad (5)$$

Assuming that there is no change in the eco-production and eco-tourism for agricultural enterprises in the five years, that is, u_2 is a constant value. The subjective assignment method is used for the primary weight (α_1) of ternary system coupling, $\alpha = (0.4, 0.3, 0.3)$. Using Changsha's economic development index (u_1), agricultural eco-production and eco-tourism index of Changsha Jinjing Tea Factory (u_2) and Internet popularity index (u_3), we calculate the coupling degree (C_3) and coupling coordination degree (D_3) of the ternary system (Table 4). At the same time, in order to confirm the coupling relationship between urban economy and Internet popularity, we calculate the binary system. We calculate the $C_{\text{economy and Internet}}$ and $D_{\text{economy and Internet}}$ coupling value of binary system. The annual changes in u_1, u_2 and u_3 values can be shown in Fig. 1. The annual changes in D_3 and $D_{\text{economy and Internet}}$ can be shown in Fig. 2. It clearly indicates the coordination and coupling relationship, $C_{\text{economy and Internet}}$ and $D_{\text{economy and Internet}}$ are well coupled and coordinated. If D_3. $D_{\text{economy and Internet}}$ is below 0.4000, it is in imbalance region; if D_3. $D_{\text{economy and Internet}}$ is 0.4000 – 0.5000, it is in basically coordinated region; if D_3. $D_{\text{economy and Internet}}$ is greater than 0.5000, it is in the well coordinated region[3]. The annual change insuggests that even if the agricultural enterprises' eco-production and eco-tourism conditions are not improved, the ternary coupling coordination degree will improve with the urban economic development and the popularity of the Internet, and can enter the well coordinated region and basically coordinated region.

Table 4 Annual calculated value of. Ceconomy and Internet and. Deconomy and Internet

	2009	2010	2011	2012	2013	Primary weight
u_1	0.1161	0.4663	0.6663	0.3899	1.0000	0.4
u_2	0.3500	0.3500	0.3500	0.3500	0.3500	0.3
u_3	0.3935	0.4674	0.4459	0.5261	0.6391	0.3
C_3	0.7431	0.5600	0.5046	0.4241	0.3601	
$C_{\text{economy and Internet}}$	0.4195	0.4999	0.4896	0.4866	0.4877	
D_3	0.4072	0.4917	0.5050	0.5040	0.4988	
$D_{\text{economy and Internet}}$	0.2890	0.4830	0.5421	0.4811	0.6595	

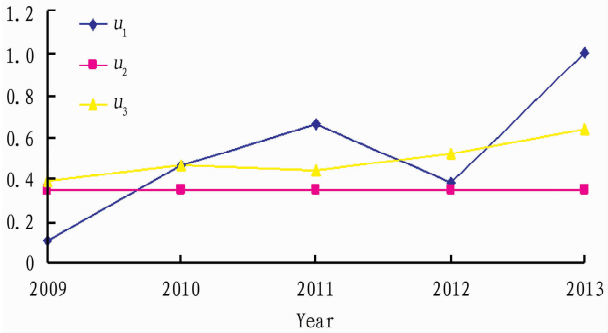

Fig. 1 The annual changes in u_1, u_2 and u_3

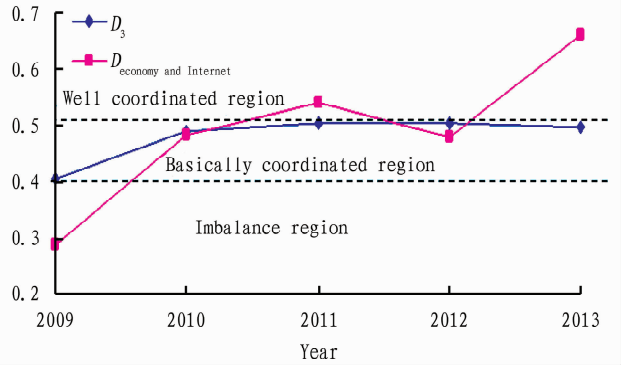

Fig. 2 The annual changes in D_3 and $D_{\text{economy and Internet}}$

6 Agricultural enterprises' eco-production and eco-tourism mode in the era of "Internet +"

Agricultural enterprises should carry out the eco-production and eco-tourism according to the index evaluation value (u_2) and the ternary coordination degree (D_3) of Internet, urban economy and agricultural enterprises' conditions. There are four modes to choose. Mode 1: When $u_2 \geqslant 0.5000$ and $D_3 \geqslant 0.6000$, the agricultural enterprises can choose the autonomous mode for eco-production and eco-tourism, and market their tourism projects on the Internet. For example, Changsha Baiguoyuan Ecological Agriculture Co., Ltd. is located in Wangcheng County, and now merged into the urban area of Changsha. The eco-production and eco-tourism items include fruit picking (more than 20 kinds of fruit varieties), farm fun, bamboo barbecue, milking, fishing and soy milk grinding, bringing considerable economic income. Mode 2: When $0.4000 \leqslant u_2 < 0.5000$, $0.5000 \leqslant D_3 < 0.6000$, the mode of cooperation with travel agency can be used (Fig. 3). Due to the multiplier effect of tourism economy, the agricultural enterprises can get great benefits. Mode 3: When $0.3000 \leqslant u_2 < 0.4000$, $0.4000 \leqslant D < 0.5000$, the tourism business transfer mode can be used. Travel agencies acquire the tourism business of agricultural enterprises through the investment. Agricultural enterprises can get part of the proceeds and enhance the competitiveness of their agricultural products, thereby solving the problem of difficult sale of the main

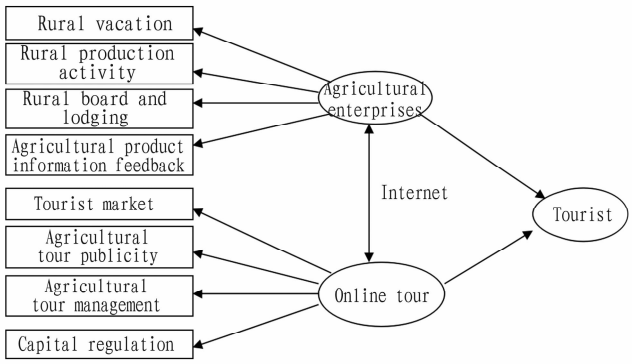

Fig. 3 The mode of cooperation with travel agency

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role in the development of rural education[12]. Therefore, it is recommended to focus on strengthening the construction of sports in rural schools, take rural sports teachers as main body, cultivate rural sports backbone, and provide rural social sports instructors, to guide farmers to take physical exercises in a scientific and reasonable manner.

4 Conclusions

Due to the particularity of rural issues, there will be a long way to achieve sustainable development of rural sports. Simply relying on several policies and regulations and allocating certain sports facilities, it is impossible to solve these issues. Apart from the sports system itself, issues of rural sports also involve the economic, social, cultural, human resources and many other aspects. Through the study, we concluded that factors influencing the sustainable development of rural sports include objective factors such as government and society, and also include subjective factors such as rural areas and farmers. Only until both objective and subjective factors are solved, may it be able to realize healthy and sustainable development of rural sports.

References

[1] CHEN N. The tendency of rural sports development[J]. Journal of Chengdu Physical Education Institute, 2003, 29(1):1 – 4. (in Chinese).

[2] XIAO L. The succession and design governance of rural public space[J]. Journal of Jiangxi University of Science and Technology, 2014, 35(4): 103 – 106. (in Chinese).

[3] YU YY. Study on the system construction of new rural community sport service in Gannan[J]. Journal of Physical Education Institute of Shanxi Teachers University, 2008, 23(2): 41 – 43. (in Chinese).

[4] TAN H. On several theoretical problem about realizing the sustainable development of sports[J]. Journal of Physical Education, 2000(5):13 – 14. (in Chinese).

[5] ZHOU JX. On the characteristics of the management of rural physical culture in China[J]. Journal of Sport History and Culture, 2012,(4):17 – 18. (in Chinese).

[6] LIANG H. Study on sustainable development of Chinese ethnic traditional sports[J]. Journal of Pla Institute of Physical Education, 2012, 31(3): 22 – 24. (in Chinese).

[7] PAN TL, LI XC, HONG L. Study on the modernization of folk custom sports based on the strategy of powerful cultural country[J]. Journal of Jiangxi University of Science and Technology, 2014,35(4):117 – 120. (in Chinese).

[8] GUO XJ. The village sports in well-off society ——Investigation on three villages in Shandong Province[J]. China Sport Science, 2009, 29(2): 81 – 95. (in Chinese).

[9] GUO CY, LI ZQ. Harmonious development of rural festival sports and new countryside[J]. Sports Science Research, 2007, 28(5): 33 – 35. (in Chinese).

[10] TAN DH. Study on the Hakkas folk custom sports and tourism[J]. Journal of Jiangxi University of Science and Technology, 2011, 32(2): 78 – 80. (in Chinese).

[11] JIANG L, RAO P, MO YR, *et al.* A sociological review on rural sports development in Chinese new countryside construction[J]. Journal of Beijing University of Physical Education, 2008, 31(11): 1461 – 1464. (in Chinese).

[12] WANG J, WU L. The study of county teachers' orientation in new county construction[J]. Journal of Jiangxi University of Science and Technology, 2008, 29(4): 88 – 90. (in Chinese).

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industry. Changsha Jinjing Tea Factory can use this mode. Mode 4: When $u_2 < 0.3000$, $D < 0.4000$, the tourism business should not be carried out so as not to waste money and manpower.

7 Conclusions

China is experiencing high-speed urbanization process. On the one hand, a large number of suburban farmlands and villages are occupied by the city and the landless farmers turn into urban population; on the other hand, the central area of the city is experiencing drastic urban construction, so as to improve the land exchange value in the central area and make the original residents move to the city periphery. This turbulence makes the new and old urban residents bear the pressure of uncertainty and challenge. The agricultural enterprises' eco-production and eco-tourism featured by rural natural landscape, local culture and strong participation, can meet their needs for relaxation and leisure, and it is really the most economical green tourism returning to the original state of life. This way of tourism has been prevalent in foreign countries for many years. In the era of "Internet +", expanding the eco-production and eco-tourism can make the agricultural enterprises in the vicinity of Chinese Cities develop by leaps and bounds.

References

[1] Changsha Yangguang Sannong Network. Public proclamation [DB/OL]. http://nb.changsha.gov.cn/news.htm id=221. (in Chinese).

[2] PENG JF. The study of urban tourism competitiveness in Hunan Province [J]. Urban Problems,2013 (6): 57 – 61. (in Chinese).

[3] SHU XL, GAO YP, ZHANG YX, *et al.* Study on the coupling relationship and coordinative development between tourism industry and eco-civilization city [J]. China Polulation. Resources and Environment,2015, 25(3): 82 – 90. (in Chinese).

[4] Hunan Statistical Information Network. Hunan Province statistical bulletin [EB/OL]. http://www.hntj.gov.cn/tjgb/szgb/changsha/. (in Chinese).

[5] WU WZ, ZHANG LP, QIU FD. Factors influencing tourism ticket charges in ancient villages and towns: Empirical research in Jiangsu, Zhejiang, Shanghai and Anhui [J]. Tourism Tribune,2013, 28(8): 34 – 40. (in Chinese).

[6] Hunan Statistical Information Network. China Internet network development state statistic report of the 36rd [EB/OL]. http://www.cnnic.net.cn/hlwfzyj/hlwxzbg/. (in Chinese).

[7] SHENG YC, ZHONG ZP. Study on the coupling coordinative degree between tourism industry and regional economy ——A case study of Hunan Province [J]. Tourism Tribune,2009, 24 (8): 23 – 29. (in Chinese).

[8] WANG YM, MA YF. Analysis of coupling coordination between urban tourism economy and transport system development——A case study of Xi'an city [J]. Journal of Shaanxi Normal University,2011,39(1): 86 – 90. (in Chinese).