Resolving the conflict between minority communities and wild boars in Dafengding National Nature Reserve (DNNR), Southwest China

Final Report

Submitted by

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1. Summary

This report derives from the field project generously supported by Rufford Small Grant program (Ref: 03.07.07) which was implemented in one year from Nov. 2007 to Nov. 2008. In Dafengding National Nature reserve (DNNR), as in many other sites, the wild boar (*Sus scrofa*) population has increased rapidly owing to the continuing effort of nature protection and the related environment changing. The growth of the wild boar population has led to an increase in the damage caused to the habitat of Giant Panda by the rooting activities and to the living of local minority community by the crop consuming. At the same time, little is known about the biology of wild boars in nature reserves in minority regions.

Under the funding from Rufford Small Grant program, this one-year study was undertaken to understand the biological and ecological characteristics of flourishing wild boar and build the assessing criteria for wild boar damages through extensive field and socioeconomic surveying. The further aim of the project was to improve the consciousness on the wild boar damages and nature conservation through many actions such as public presentation, environment education and gathering talking with local communities. On the basis of data and information collected from all sources, the team decided and practiced the reasonable responding strategies to manage and control the wild boar damages.

Fig. 1 Meng Xiuxiang working in the field (2009. Photo by Wang Gong

In DNNR, more than 200 sampling belts were surveyed in summer and winter. Through analyses, we sound that such seven factors as vegetation and plant diversity factor, human disturbance factor, abundance of food factor, water factor, topography, concealed factor and aspect factor influence the occurrence of wild pig. There are 1405~2068 wild pigs in DNNR. In total, 5%~10% of local corps was damaged by wild life, mainly by wild pigs.

Throughout public community presenting work, we publicized the concept of nature conservation, the value of endangered animals etc. We visited 200 Yi households door by door to collect the information about their living and production system, and discuss with them to explore the potential substitute production styles to reduce the pressure on the musk deer population and its habitat from

their conventional production. We found that the ecological farming is the best compensation for the wild-pig damages. More than 200 Yi peoples were trained in ecological farming for 12 days. We provide 400 Bee-buckets to 100 Yi families and 100 families were funded for wild-pig faming.

The Nature conservation will be related to the Fundamental Biological Studies, Ecological development and Education Improvement. We educate premature to value and conserve wildlife and its habitat through our lecturing at the local prime school and some public presentation such as specimen exhibition, scientific video playing etc, to publicize the conservation of musk deer and habitat among local Yi Nationalities community. In total, 8 members lectured for more than 200 Yi adults and pupils for 3 months; Furthermore, one journal paper has been composing, and team members attended national conference 1 times and make public presentation 5 times;

2. Studying area and working site

2.1 Geographic information

This project was carried out in 2007 to 2008 in the area Dafengding National Natural Reserve (DNNR). DNNR of Sichuan Province is in mountainous region of southwest China (Fig.2, Fig.3, Fig.4, Fig.5), which is one of international 25 hot spot critical ecosystem conservation regions, namely the Mountains of Southwest China, (23rd hotspot, Conservation International, www.conservation.org), and with dramatic variations in climate and topography.

DNNR is a science and nature reserve with an area of 331 Km2 and with altitude from 1240~3835 meter, and locates from 103°05' to 103°20' E and from 28°36' to 28°45'N, which was established in Meigu County, Sichuan with ratification of the State Council in 1978. In DNNR, the humid climate of subtropical monsoon is very clear, and winter is relatively dry, sunny. The annual average temperature is 10.2 ° C, with an annual rainfall of 1,089 mm, and 80% relative humidity frost-free period is 280~230 days.

Moreover, DNNR is very special that there are totally 30, 000 Yi Peoples distributed in the nature reserve (Yi People is one of the 55 minorities in China). Yi People is the native nationality to the Liangshan region, of which SNNR is the core distributive area. For a long time, however, the potential impacts from the conventional production of Yi People has been not been assessed.
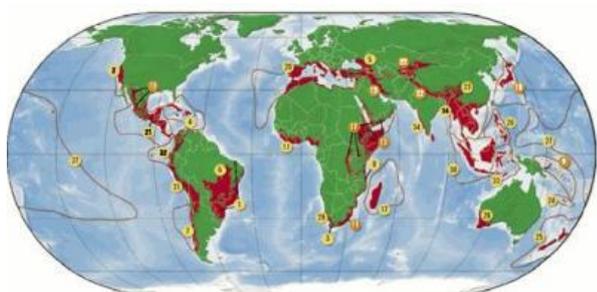
Fig. 2. DNNR locates in 23rd biodiversity hotspot

Fig.3 Location of DNNR in China

Fig.4 Location of DNNR in China.
*Made by Guang Ma*
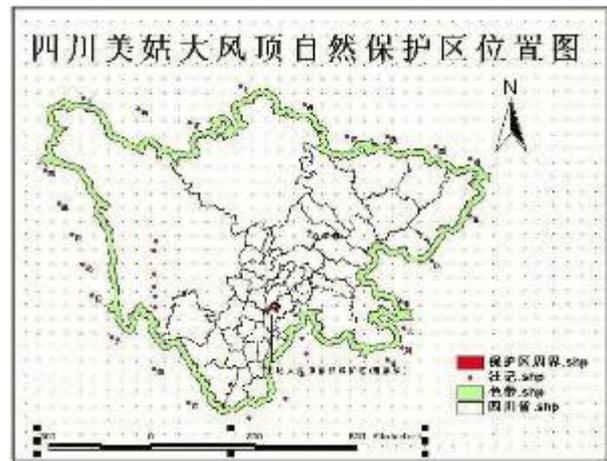
Fig.5 Location of DNNR in Sichuan Province

2.2 Biological Diversity

This region supports a wide array of habitats including the most endemic-rich temperate flora and fauna in the world. The forest musk deer (*Moschus berezovskii*) (Fig.6), golden monkey (*Rhinopithecus roxellana*), giant panda (*Ailuropoda melanoleuca*) (Fig.7), Hynobiids (*Hvnobius chinensis Guenther*) (Fig 8), *Tylototriton taliangensis* (Fig 9), red panda (*Ailurus refulgens*), and a number of pheasants (e.g., Blood Pheasant, *Ithaginis cruentus*) are among the threatened species endemic to this hotspot. In total, Dam construction, illegal hunting, overgrazing, and wood gathering are the primary threats to biodiversity in this region.

Fig.6 Forest musk deer. Photo by Meng

Fig.7 Giant panda. Cited from QSYO

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Fig.8 Hynobiids in DNNR. Photo by Meng

Fig.9 Tylototriton taliangensis

3. Information on the wild pig (*Sus scrofa*)

Wild pig (*Sus scrofa*) (Fig.10) distribute widely in China, and the DNNR is the core region of its distribution (Fig.11).

Wild boars are ubiquitous rooting omnivores that are known to affect a variety of ecosystems throughout the world by disturbing soil, spreading weeds, preying on invertebrates and small vertebrates, competing with large vertebrates, preventing forest regeneration, and causing damage to agricultural land (Baubet, et al., 2004; Welander 1995).
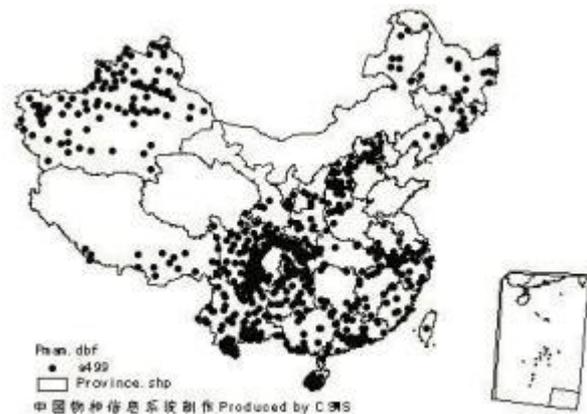

Fig.10 Distribution of wild pig in China. Cited from WCS

Fig.11 Wild pig

In the 1970s and 1980s, especially after the 1980s, the dramatic deforestation and the overload hunting of years have made wild pig to be seriously damaged. In 1990s, the wild pig has been conserved as Category 2nd protected animals in China and the hunting has been forbidden. Since then, the wild pig grows rapidly and the flourished population has been damaging the natural environment and the agriculture, especially in minority regions of Western China including the current working site, namely Dafengding National Nature Reserve (DNNR).

4. Wild boar habitat and population in DNNR

4.1 Summer habitat surveying

Fig.12 Overall habitat of wild pigs in DNNR. Photo by Ren Wei

Fig.131 Team member go to survey. Photo by Ren Wei

Generally, wild boar could occur in any habitat including forest, meadow and shrub. In DNNR, Wild pig prefer the forested environments an its favourite habitat is mountainous terrain covered by dense forests(Fig.12), which makes it very difficult to observe and survey directly in the field(Fig.13), however, the feces, dent and footprint that it left are effective indicators of habitat selection and population surveying (Fig.14~19).

Fig.14 Footprint of wild pig. Photo by Ren Wei

Fig.15 Peeling of wild pig. Photo by Meng

Fig.16 Summer de of wild pig. Photo by Meng   *Fig.17 Faces of wild pig. Photo by Meng*

Fig.18 Booting of wild pig. Photo by Ren Wei   *Fig.19 Feeding site of wild pig. Photo by Ren Wei*

Dueser and Shugart (1978) created a detailed sampling technique combining plots of various sizes and shapes, as well as small transects, which later proved to be applicable for most terrestrial vertebrates, especially the ungulates such as wild pig (Morrison *et al*. 1992), so we adopted this method to quantify the habitat of wild pig and made some modifications in design variables, and the quantified variables listed in following:

Canopy: Canopy of over story vegetation in the 400-m2 plot; Slope: Slope of the plot, from 0° to 90°; every 10° is a category; Slope aspect: Aspect of the plot, four categories: east-facing (45–135°), south-facing (135–225°), west-facing (225–315°), and north-facing (315–45°); Slope position: Position of the plot on the hillside; three categories: upper (>2700 m), middle (2000~2700 m), and lower (<2000 m); Vegetation type: Six categories: mixed evergreen and deciduous broadleaf forest, mixed conifer and broadleaf forest, conifer forest, shrub, grassland, and bare land; Bamboo density: Average number of culms in bamboo plots; Bamboo height (cm) : Average height of culms plots; Tree density: Average number of trees in two 20-m2 rectangular transects; Tree size (cm): Average diameter at breast height (DBH) of the trees nearest the centre in each plot; Tree dispersion (m): Average distance to the trees nearest the centre in each plot; Shrub density: Average number of shrubs inransects; Shrub size (cm) :Average DBH of the shrubs nearest the centre in each plot; Shrub dispersion (m) :Average distance to the shrubs nearest the centre in each plot; Tree-stump density: Average number of tree stumps (>15 cm in diameter) in each plot; Tree-stump size (cm): Average diameter of the tree stumps (>15 cm in diameter) nearest the centre in each plot; Tree stump dispersion (m): Average distance to the tree stumps (>15 cm in diameter) nearest the centre in each plot; Fallen-log density: Average number of fallen logs (>15 cm in diameter) in each plot; Fallen-log size (cm): Average diameter of the fallen logs (>15 cm in diameter) nearest the centre in each plot; Fallen log dispersion (m): Average distance of the fallen logs (>15 cm in diameter) nearest the centre in each plot; Herb-cover proportion (%): Proportion of herb-cover area in the plot; Water-source dispersion (m): Estimated straight-line distance from the sampling plot to the nearest water source; Concealing condition (m): Mean greatest distance looking eastward, southward, westward, and northward at a height of 1.0 m at the centre of the sampling plots; Open-land proportion (%): Proportion of land area without bamboo cover in the plot;

During field surveying, when some cues were decided, a sampling plot (20X20 M2) would be designed and the variables would be quantified and recorded. Collaborated with the local guide and forestry officials, several researchers quantified the related ecological variables and recorded the data in the forms prepared in advance, and the recording is as detailed as we can (Fig 20~23). In

total, 106 summer habitats were surveyed and the in which every variables was quantified and recorded. The distribution and the frequency of ecological variables were showed in Tab 1. In DNNR, wild pig prefer shrub-fern habitat, which is 46.2% of all surveyed habitats (Fig 24). At the reserve level, the habitat with the above characteristics always locates at the edge of forest and near to the farmland. Thus, more often than not, the wild pig could damage the local plant and corn (Fig 25). Furthermore, the Wild pig could occur in the shrub-bamboo (24.5%) and the mixed coniferous and broad-leaved forest in summer (29.2%) (Fig 26~27).

Fig.20 Researcher working in, the field. Photo by Ren

Fig.21 Researcher working in the field. Photo by Liu

Fig.22 Researchers and the local guide

Fig.23 Researchers and the guide

Fig.24 Habitat: Shrub-Fern. Photo by Ren   *Fig.25 Damage resulted from the wild pig. Photo by Ren*

Table. 1 Frequencies of ecological variables in summer habitat of wild pig

Variable	Item	Percent% (Frequency)
Vegetation type	Shrub-Fern	46.2(49)
	Shrub-Bamboo	24.5(26)
	Forest	29.2(21)
Traces type	Dent	18.9(20)
	Feeding site	75.5(80)
	Faces	5.7 (6)
Slope aspect	East	7.5 (8)
	South	32.1(34)
	West	27.4(29)
	North	28.3(30)
Slope position	Upper	58.5(62)
	Mediate	34.9(37)
	Lower	6.6(7)
Slope degree	0	9.4(10)
	1	1 70.8(75)
	2	2 15.1(16)
	3	3 3.8(4)
Soil moisture	0	22.6(24)
	1	1 17(18)
	2	2 34.9(37)
	3	3 20.8(22)
Canopy	0-30%	46.1(35)
	30-60%	26.3(20)
	60-100%	27.6(21)
Cover of grass	0-30%	26.7(27)
	30-60%	20.8(20)
	60-100%	52.5(52)
Human disturbance degree	Less	42.5(45)
	Mediate	29.2(31)
	Heavy	28.3(30)
Distance to water	0	9.4(10)
	Close	38.7(41)
	Mediate	0(0)
	Far	51.9(55)
Farmland distance	Close	18.9(20)
	Mediate	42.5(45)
	Far	38.7(41)
Distance to village	Close	28.3(30)
	Mediate	41.5(44)
	Far	30.2(32)

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Fig.26 Habitat: Forest. Photo by Ren

Fig.27 Habitat: Shrub-bambo. Photo by Ren

Table.2 Eigenvalues of habitat variables by wild boar in summer

Component	Eigenvalues	Percent %	Cumulative Percentage
1	3.972	19.860	19.860
2	3.102	15.512	35.372
3	1.990	9.950	45.321
4	1.780	8.899	54.220
5	1.419	7.097	61.317
6	1.254	6.268	67.586
7	1.170	5.850	73.436

Table.3 Rotated component matrix on loading coefficients of habitat variables during summer

Variable	Eigenvector						
	1	2	3	4	5	6	7
BDH	0.829	-0.265	0.218	-0.06	-0.08	0.04	0.10
Arbor Height	0.805	-0.168	-0.02	-0.133	-0.271	-0.06	0.214
Slope position	-0.665	-0.292	0.205	-0.191	-0.183	3.305E-02	0.217
Vegetation type	0.602	0.05	0.152	-0.203	-0.05	0.269	0.118
Number of tree	0.559	-0.441	0.08	-0.149	.0186	0.209	0.03
Number of plant	-0.288	0.828	-0.167	0.144	0.06	0.103	0.03
H Index	0.02	0.790	0.01	-0.08	-0.104	-0.06	0.09
Distance to village	0.05	-0.171	0.885	-0.07	0.220	-0.144	-0.112
Distance- farmland	0.06	-0.02	0.765	-0.02	0.505	-0.235	-0.118
Anthropogenic dispersion	-.0152	-0.03	-0.634	-0.07	0.372	-0.159	0.119
Colour-soil	-0.175	0.245	0.217	-0.751	-0.225	-0.137	-0.145
Grass-cover	-.0182	0.07	0.07	.740	-0.08	-0.174	-0.196
Grass-number	-0.249	0.369	0.02	0.606	-0.211	-0.08	0.107
Distance to water	-0.06	-0.10	0.108	-0.05	0.835	0.04	-0.04
Soil moisture	-0.188	-0.10	0.10	0.518	0.577	-0.234	0.315
Canopy	0.315	-0.226	0.04	-0.303	0.03	0.761	0.208
Slope degree	0.10	0.266	-0.150	0.50	0.40	0.704	0-.191
Elevation	0.163	0.195	0.08	-0.05	0.434	-0.672	-0.245
Slope aspects	4.810E-02	-0.02 7	-0.237	0.121	0.07	0.07	0.76
Grass height	-0.305	-0.396	0.20	0.188	0.136	-0.20	-0.672

Data analyses were done with SPSS 11.0 and some statistic methods such as the Kruskal–Wallis test and ANOVA were utilized to explore the potential differences in habitat selection of wild pig, and PCA (Principal Component Analysis) was used to decide the main influencing factors which impose the important impacts upon the habitat utilization of wild pig in DNNR.

As showed in Tab. 2 and Tab 3, the wild boar summer habitats principal components factor analysis shows that vegetation and plant diversity factor, human disturbance factor, abundance of food factor, water factor, topography and concealed factor, aspect factor were the main seven factors to decide the summer habitat selection of wild pig in DNNR.

Combined with the results of PCA, we found that different types of traces of wild pig habitat differed in vegetation factor, abundance of food, geographic terrain factor, and anthropogenic interference factor. Different kinds of vegetation types varied in vegetation, geographic terrain factor and hidden factor. As wild habitats distance to the land varies, the total kinds of plant mainly differ in vegetation, human disturbance factor, geographical terrain factor and hidden factors. The vegetation types and traces of the type associated significantly and wild pig preferred shrubs and bamboo as den habitats, and were more inclined to feed in ferns shrub and in mixed coniferous forest.

4.2 Habitat surveying in winter

From Dec. 2007 to Feb. 2008, the winter habitats were surveyed in DNNR. The variable definition, plot sampling and the analyses were the same as the studies in summer. Based on the hints such as den, footprint and rooting sites of wild pig (Fig 28~Fig 32), the winter habitats were be determined and the related data were collected.

Fig.28 Determination of winter plot. Photo by Yin *Fig.29 Habitat surveying in winter. Photo by Yin*

Fig. 30 Winter den of wild pig. Photo by Yin   *Fig.31 Winter digging of wild pig. Photo by Yin*

Fig. 31 Winter faces of wild pig. Photo by Yin   *Fig.32 Winter footprint of wild pig, Photo by Yin*

Fig. 33 Researchers worked in the winter habitats of wild pig. Photo by Yin

Table.4 Eigenvalues of habitat variables by wild boar in winter

Component	Eigenvalues	Percent %	Cumulative Percentage
1	4.208	16.186	16.186
2	3.724	14.322	30.508
3	3.004	11.555	42.062
4	2.593	9.973	52.036
5	1.802	6.930	58.965
6	1.774	6.825	65.790
7	1.675	6.442	72.232

The Principal Component Analysis was utilized to explore the most important factors deciding the ecological characteristics of winter habitats of wild pigs. The results (Tab4 and Tab 5) showed that the key factors determined the habitat selection in winter was very similar to the patterns in summer, in which, seven influencing factors were decided such as Vegetation Factor, Sheltering Factor, Origin factor, Food Factor, Ground-surface Factor, Water factor and Soil Factor.

Based on the results and the direct observation in the field, wild pig was inclined to utilize the habitats locates in sunny slope and with relative more ground covering which is more often than not dried, furthermore, its winter habitat was more closer to water source and far away from the anthropogenic impact such as the trail and village (Fig 34~39).

Fig. 34 Sunny habitat of wild pig in winter. Photo by Yin

Fig.35 Ground cover in winter habitat, Photo by Hui

Table.5 Rotated matrice on loading coefficients of environmental factors for wild pig in winter

Variable	Eigenvector						
	1	2	3	4	5	6	7
Elevation	0.854	-0.05	-0.162	-2.304E-02	.134	.207	.189
Forest type	0.841	0.163	0.117	-.258	-1.381E-02	-9.710E-02	.101
Slope position	0.808	0.155	7.941E-02	-.261	.229	6.504E-03	-4.018E-02
BDH	-0.594	0.287	-6.226E-02	-8.117E-02	.322	4.991E-02	-6.813E-02
Shrub covering	0.032	-0.876	-2.983E-02	.294	-8.642E-02	6.988E-02	4.626E-02
Sheltering	-0.309	0.760	0.051	-.171	-.227	.357	1.334E-02
Slope aspects	0.034	0.725	0.341	.393	4.257E-03	-.129	4.137E-02
Anthropogenic dispersion	0.316	0.585	0.025	.222	.200	-.452	3.192E-02
Distance shrub	0.168	0.566	0.186	.159	-1.655E-03 .	166	-.473
Num tree	-0.139	0.315	0.705	.225	.285	-6.472E-02	.337
Height tree	-0.412	0.021	-0.638	4.201E-02	.142	6.797E-02	.264
Origin	-0.349	0.056	0.635	9.691E-03	-1.787E-02	-.122	-.348
Distance arboreal	-0.032	-0.064	-0.574	-.388	.116	8.755E-02	-4.378E-03
Height arboreal	-0.380	.248	0.499	-.257	.310	-8.012E-02	.417
Dried species	-0.084	-0.068	-0.488	6.142E-02	4.756E-03	-.109	5.019E-02
Height shrub	-0.016	-0.021	0.053	.677	-4.400E-02	6.401E-02	3.244E-02
Num arboreal	-0.328	0.159	-0.102	.667	.230	.124	8.242E-03
Num shrub	-0.176	-0.158	0.039	.625	-.181	-.572	7.770E-02
Species green	-0.310	-0.405	0.236	.540	-4.922E-02	-.372	-7.962E-02
General cover	-0.115	0.116	0.023	8.779E-02	.903	-4.190E-02	-.259
Dried cover	0.223	-0.125	-0.097	-8.160E-02	.853	-8.150E-02	.233
Topography -	0.270	0.150	-0.351	.171	6.999E-02	.723	-4.735E-02
Distance to water	0.274	-0.173	0.186	2.141E-02	-.223	.674	-4.347E-02
Cover vegetation -	0.071	-0.016	0.137	-.187 9	.595E-02	-.106	-.767
Soil moisture	0.252	-0.099	-0.063	-6.835E-02	3.851E-02	-.400	.696
Slope degree	0.177	-0.034	0.263	-.111	.439	.410	.466

Fig.36 Winter faeces of wild pig, Photo by Yin

Fig.37 Winter habitat of wild pig, Photo by Huin

Fig. 38 Winter habitat of wild pig, Photo by Huin

Fig.39 Winter faeces of wild pig, Photo by Yin

4.3 Population surveying of wild pig

In the summer, the wild pig population surveying was conducted at 15 sites such as Longwo, Zuluyize, Laomuga and Hongxi etc. The surveying method of mixed sampling line-belt was used to count and record the number of the wild pig hints such as den, feeding sites, bedding site, rooting sites and the pig individuals (Fig 40~42).

In total, 106 belts were built, in which the wild pig populations were recorded. Based on the collected surveying data, the general density was estimated as the 4.22~6.21 /Km2, and there are 1405~2068 wild pigs.
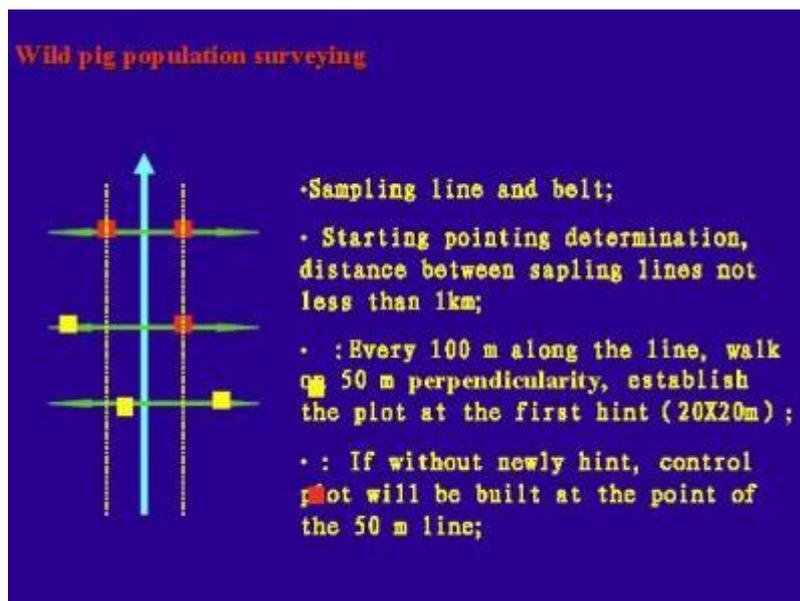
Fig.40 Method system of wild pig population surveying. Made by Meng

Fig.41 Population surveying in the field.   Fig.42 Population surveying in the field. Photo by Meng
Photo by Meng

4.4 Damages from the wild pig and the social-economy surveying

4.41 Wild pig damage surveying

The damages on the crop and the living of local communities from the wildlife were surveyed. Researchers will be leaded by the local guide and officials, and go to the minority households and talk with the local families. The data of the wildlife damages and all other social-economical information were recorded in the forms made in advance (Fig 43).

In DNNR, there are many wildlife could impose damage to the living of the local communities including monkey, musk deer, feral dog, badger and even panda, however, among all the above animals, wild pigs do the most serious damages to the local peoples.

In total, the wild boar and other wild animals damaged the crop loss at 5%~10%. High elevation of farmland is seriously damaged; the boar has certain preference for different types of crops.

Guarding by human and dog were effective. Community residents were not compensated for their loss. 20% of the residents do not agree with the pig's protected status but all of the residents can understand the difficulty of Nature Reserve.

Fig.43 Table used in the damage surveying. Made by Meng

Fig.44 Local minority village. Photo by Meng *Fig.45 Farmlands and habitat of wild pig. Photo by Meng*

Fig.46 Different wild pig guarding. Photo by Meng

Fig.47 Surveying talking in winter. Photo by Meng

Fig.48 Surveying in summer. Photo by Meng

5 Social-economic surveying

Although, the Chinese government announced the permanent cessation of deforestation in 1998 and all staff of forestry enterprises will move towards an afford station policy in the future. This positive step will improve the prospects for musk deer survival over its entire range. However, the conventional productive efficiency of Yi in DNNR is very low and Yi peoples live in absolute poverty, so that local Yi peoples have been deforesting to earn their life and reclaiming spacious but low efficiency land to plant, and the core region of natural reserve has been coming to be reduced and the habitat of musk deer has became degraded, fragmented, even lost. Generally, the rooted reason for the local deforestation is poverty, so the economic development of the local households will directly improve the musk deer habitat conservation.

Supervised by the sociological experts in Central University for nationalities such as Prof Zhang Haiyang, Dr Hou Yuangao and Dr Jia Zhongyi, the surveys were conducted by the integrated methods of ethnological, anthropological, economical and human ecological methods, in which door by door semi-structured surveying, inquiring at the local timed market and interviewing with Yi peoples and local authorities etc were utilized to collect the information and data of the social economical structure and status in DNNR. Moreover, our team member used to participate into the local productivities to find the influencing factors limited the local economical development, and investigations were combined by means of questionnaire surveying to find relevant information of local households (Fig.49~54).

Fig.49. Coming back from talking with local people. Photo by Meng

Fig.50 Go to local households. Photo by Yin

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Fig.51 Talking with local official. Photo by Yin

Fig.52 Local minority village. Photo by Yin

Fig.53 Talking in family. Photo by Zhong

Fig.54 Talking with local official. Photo by Zhong

In DNNR, more than 90 percent of people are farmers, and almost people in this region do not speak Chinese but their own languages, namely Yi (Fig.55~56).
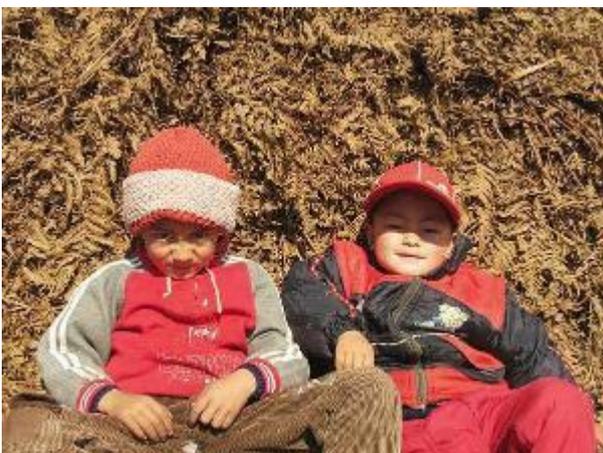
Fig.55 Yi boys. Photo by Meng

Fig.56 Tiny shop in the town. Photo by Meng

In the traditional, native Yi people resided in the DNNR mountains, who earned their life by farming, picking, hunting, logging and nomadic husbandry. Since the establishment of nature reserve, hunting and logging are prohibited and they lost part of plowland, but due to the lack of alternative forms of economic systems, the community economical structure has not changed and community living has not improved much, so the conventional productive systems have impose tremendous disturbance upon the forest musk deer and its habitat, and caused to the habitat fragment even loss, at last, the big conflict has lied between nature conservation and local communities (Fig.55~56).

Fig.57 Local old man. Photo by Erbu Gan

Fig.58 Yi woman and potato. Photo by Meng

Fig.59 Pigs reared in range. Photo by Meng

Fig. 60 Local peoples facing up researchers. Photo by Meng

Based on our data, the productive and living system of DNNR Yi communities have been very traditional, and the productive efficiency was relatively low. Moreover, the living pattern was primitive and depend more on the utilization nature resources, however, which imposed huge impacts on the local environment.

The land using was very simple and coarse. In some sites which the soil is unsuitable to plant, but those area has been deforested and potato has been planted. Due to the long-term excessive herding and grazing with primitive methods, alpine pastures in the core area of DNNR has been damaged severely, and large tracts of grassland has been degraded and even desertification phenomenon has been happened. Grazing of livestock leads to high pressure on the vegetation, and wildlife habitat has been destroyed at some extent, which will speed the population extinct of such endangered animals as forest musk deer, giant panda and red panda (Fig.61~Fig 62).

Fig.61 Village in mountains. Photo by Meng   *Fig. 62 Farmland and Yi people. Photo by Meng*

In DNNR, another influencing factor of habitat loss is heavy wood collecting. DNNR is located in the hinterland of Liang Mountains and with the characteristics of high-altitude and lower average temperature, so the fire wood must been spent to get heat and energy in almost whole day and year, moreover, the traditional Yi was built on three pieces of rocked station on the ground,, in which the consumption volume of firewood is high. Because of the large amount of wood consumption, the vegetation surrounding villages has been severely damaged, and the forest decline has gradually eroded internal to the core area of nature reserve.

Presently, in order to reduce the fire wood consumption, some alternative energies have been tried and utilized in some Yi communities of DNNR, and the electricity, coal and other alternative energy usage has been encouraged by government and nature reserve, so the fire wood consumption of this village is significantly lower than other villages. So, we want to demonstrate that, the exploration and use of appropriate alternative energy is the ultimate method to mitigate the wood consumption.
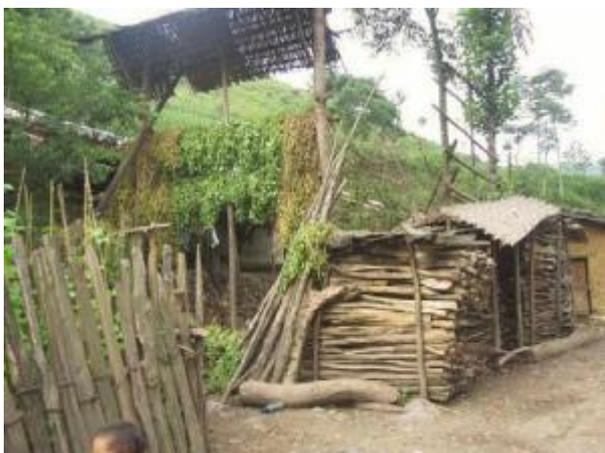
Fig 63.Wood collected from the reserve.   *Fig 64. Traditional building of Yi People. Photo by Meng*
Photo by Meng

In the interviewing and talking with local peoples, all locals said that they have been supporting the wildlife conservation if their living will not be influenced, and most of them knew that such endangered wildlife as Giant panda and forest musk deer are protected animal and the hunting is illegal practice.

However, owing to the flourished wild pig populations which damaged the corps and plants and influence their living, 90% Yi people do not accept wild boar, and most of the villagers want to shot wild boar to mitigate hazards caused by boars, but only some of Yi people knew the wild boar is protected. Furthermore, most of the villagers declared that their corn loss imposed by wild pigs

should be compensated by nature reserve or local government, but now, the effective ecological compensation system has not been established because of the shortage of fund, policies, even compensative criteria, so the huge conflict has been lied among wildlife, local communities and nature reserve, which will do harm to the nature conservation and the welfare of local Yi people (Fig 66~Fig 72) .

Fig 65 Potato land damaged by wild pig. Photo by Habu

Fig 66 Talking by the fire. Photo by Meng

Fig 67 Surveying by the road. Photo by Habu

Fig 68 Surveying at the gathering. Photo by Meng

Fig 69 Pigs reared in range. Photo by Meng

Fig 70 Team camping in the habitat. Photo by Meng

Fig 71 Corn and house of Yi. Photo by Meng

Fig 72 Core of the house in Yi living. Photo by Meng

Based our data including habitat and population surveying, added the intensive talking with local people and officials, we found that it is very difficult for local government and organization to establish the direct Ecological Compensation Policy to compensate the damages from the e=wild pigs, but it will be possible to compensate by other measures such as alternative living style, through which the damage could be deleted, wild pig resources could be utilized and the local poverty could be reduced effectively. (Below: Ecological Farming).

6 Practice of Ecological Farming as an alternative living styles (Wild boar faming and bee-rearing)

Traditionally, the local animal breeding including pig farming is free style, and the pigs was not in captivity, and some female pigs mate with male wild pigs, then the hybrid pigs known as "ecological pig" will be born. Because of no hormones, no drug residues, tenderness, fragrant and sweet, nutrient-rich, low fat content and medicinal health effects and other unique features of the new century "green food.", the market price of the ecological pig is very high compared to the traditional meat, so if the market could be developed, the ecological pig farming will be very profitable to the local Yi communities, and then the local poverty could be reduced and the damages caused by wild boars would be effectively limited.

In our social-economical surveying, We visited Yi People door by door to collect the information about their living, production etc., and discuss the potential substitute production style with them to reduce the pressure on the percent species from their conventional production, which including the planting of medicinal materials, farming of economical animals and traditional Yi articles etc., then we found that the ecological farming including wild pig and apiculture could be acted as the appropriate alternative living styles.

Under the help of many sources, we help local peoples establish their own society named Dafengding Society of Ecological farming (DSEF), and the constitution for the society was built up, and the society will be managed by the local peoples voted by the communities.

四川凉山 "美姑大风顶生态养殖协会" 章程

第一章　总则

第一条：四川凉山美姑大风顶生态养殖协会由县、区、乡（镇）各级党组织领导，中央民族大学生命与环境科学学院作为技术及信息支撑和服务的少数民族基层民间组织，本协会坚持科学发展观，致力于民族地区"社会主义新农村建设"创新模式的探索和实践，以实现助农增收、推动农村社区经济发展为目的，努力让入会农户脱贫致富，并依托本协会促进民族社区的可持续发展。

第二条：本协会的根本宗旨是全心全意为人民服务，把增加入会农户收入作为中心任务和最终落脚点，并鼓励更多农民入会，帮助更多群众共同致富。

第三条：本协会坚持"入会自愿，退会自由，惠益共享"的原则，指导帮助会员共同致富，整个管理过程中无偿为会员服务。双方要按照章程规定办事，不得随意违反。

第四条：本协会会员之间要相互帮助，互相学习，经常沟通，和谐共处，共同富裕，建立良好的会员关系。

第二章　组织结构

经过县、区、乡（镇）各级党组织以及中央民族大学生命与环境科学学院的项目工作队共同商议，确立了四川凉山美姑大风顶生态养殖协会的组织结构：

会长：1名，负责管理整个协会（第一届会长：阿年拉机）；

副会长：1名，负责协助会长工作（第一届副会长：吉俄觉觉）；

执行会长：1名，负责协调协会的事宜实施（第一届执行会长：色特尔达）；

秘书长：1名，负责实施协会的各项事宜（第一届秘书长：沙马备石）；

组长：2名，负责协会中会员之间以及会员和会长之间的交流；

技术支撑：中央民族大学生命与环境科学学院，负责协会的技术及信息支撑；

技术指导员：中央民族大学生命与环境科学学院项目工作队队员；

Fig 73 The first page of the Constitution of the DSEF

6.1 Training

Four members of my team worked in this special topic, which studied the related farming of wild pig and bee and collected enough data. Furthermore, they prepared some handbook for local farmers.

Fig 73 Starting of the Farming project. Photo by Hui Fig 74 Starting of the training. Photo by Hui

Under the help of the local officials and the nature reserve, the local peoples were gathered and team leader spoke to them and told them that the whole procedure and plan of the ecological farming, and it was emphasized that they would not be requested to pay for the farming except the den and the labour (Fig 73~Fig74).

Fig. 75 Member lecturing to Yi. Photo by Meng   Fig.76 Yi People in training, Photo by Meng

Fig. 77 Member lecturing to Yi. Photo by Meng   Fig.78 Yi People in training, Photo by Meng

After the training for 12 days, then the Yi peoples were gathered. The Ecological Procedure was explained in detail. Then the contracts were provided to farmers and make sure that they understand the policy. Then 200 yuan RMB (30 US dollars) was given to one family for wild pig farming, in total 100 families get such seed money.

As we have built up collaboration with one Ecological farming Company which could provide these YI family with newborn pig at the price of 100 RMB every pig, so one family could start faming 2 pigs owing to the seed money provided by team. In total, we spent 20, 000 Yuan RMB (3000 US dollars) in wild pig farming. and the bucket provision is free of money. **100 receiver** did not need to pay this seed money but will provide two newborn pigs to another poor family in next year.

Furthermore, we spent 10, 000 Yuan in to buy 400 Bee-buckets which is the traditional tools to rear bee in the apiculture. All these buckets provided to the local peoples to help them begin bee rearing. One family was given 4 Bee-buckets, and the buckets provided to 100 families free of money. The receiver just will provide four newly buckets to another family in next year. The contract see the Fig 79, and the whole procedure see Fig 80~ Fig 83.

四川凉山美姑大风顶生态养殖协会农户入会协议

受世界银行·中国发展市场的项目资助（项目执行单位为中央民族大学生命与环境科学学院，项目号：0898），四川美姑大风顶国家级保护区、美姑挖黑乡政府及美姑挖黑社区农户成立了美姑大风顶生态养殖协会（详见所附协会章程）。美姑大风顶生态养殖协会（以下简称甲方）帮助入会农户（以下简称乙方），双方约定如下：

第1条：乙方申请自愿加入甲方后，成为甲方的核心发展对象，乙方加入甲方不需交纳任何费用，但乙方要配合并服从甲方的统一管理，以市场为导向，以合作为基础。

第2条：甲方免费为乙方提供生态养殖相关信息及可能的帮助，并提供技术培训，甲方统筹管理并协助乙方销售养殖产品，使其养殖和监最大化；

第3条：乙方正式加入甲方后，由甲方提供养殖建议。甲方向乙方提供初始养殖种苗。

第4条：乙方在养殖过程中，由甲方协调管理，民主解决问题，实施自治化管理。养殖初步成功后，由甲方统筹管理产品，并尽力建构销售渠道，统一出售，以求规模化效益。

第5条：乙方不得私自处理发放的养殖种苗，养殖产品要统一由甲方管理，不得私自买卖或转让。养殖过程中，养殖畜禽如出现微小疾病，乙方可自行救治。若出现较严重的问题，一定要向甲方报告，由甲方协助乙方治疗。养殖过程中，养殖畜禽一旦死亡，要向甲方报告，由甲方备案记录，并根据实际情况，再行决定是否补充种苗。

第6条：乙方在得到收益后，要免费向甲方提供生态养殖种苗（首次种苗提供活动定于2007年9月前，由生态养猪农户向协会提供1个20斤以上的猪苗，由生态养蜂农户向协会提供2个蜂桶），由甲方负责管理，并向下批入会农户免费发放。

第7条：如有未定事宜，由甲乙双方协商议决，并告知中央民族大学生命与环境科学学院。

甲方：四川凉山美姑大风顶生态养殖协会   乙方：

签字：   签字：

年 月 日   年 月 日

Fig 79 Contract between the DSEF and the family

Fig.80 Numbering the bee-bucket. Photo by Meng

Fig.81 Bee-Bucket receiver. Photo by Meng

Fig.82 Bee bucket. Photo by Hui

Fig.83 Training of bee rearing. Photo by Meng

*Fig.84 Gathering with farmer. Photo by Hui*
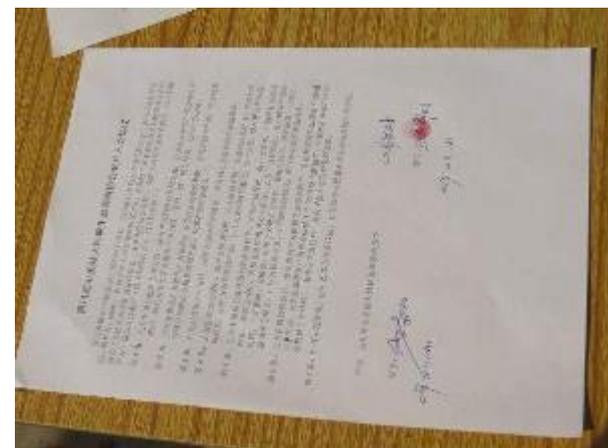
Fig.85 Contract signed by farmer. Photo by Hui

Fig.86 Contract signing. Photo by Meng

Fig.87 Contract signing. Photo by Meng

Fig.88 Seed money provision. Photo by Meng

Fig.89 Member of the DSEF. Photo by Meng

6.2 Practicing of Ecological Farming (wild pig farming and bee rearing)

Bee-breeding is the traditional production of local Yi communities, only that the breeding methods is very primitive, but the honey is of very high quality (Fig.33; Fig.34), so the efficiencies and production scale is low. So, if the local communities could be trained to improve the methods and production of bee breeding, then this production style should be profitable to reduce the local poverty.

Fig. 90 Traditional breeding. Photo by Meng

Fig. 91 Team members and employed horse. Photo by Ren

Fig. 92 Traditional breeding in local community. Photo by Meng

Fig. 93 Newborn ecological wild pig. Photo by Meng   *Fig. 94 Newborn ecological wild pig. Photo by Meng*

Fig. 95 Bee buckets. Photo by Meng   *Fig. 96 Bee-bucket and bee. Photo by Meng*

Fig. 97 Local traditional pig breeding in Yi minority. Photo by Meng

Fig. 98 Den: the wild pig breeding. Photo by Meng

Fig. 99 Den: wild pig. Photo by Yin   *Fig 100. Den habitat in winter. Photo by Yin*

Fig 101. Village joining into bee breeding. Photo by Meng   *Fig 102 Bee-buckets dispersing. Photo by Meng*

Fig 103 Going home with dispersed bee buckets. Photo by Meng

Fig 104 Researching team and the local people joined in DSEF. Photo by Meng

6.21 Wild pig farming

Forest musk deer inhabit forested mountainous landscapes, and nearly all the activities occur in forest. Deforestation causing forest fragmentation is a severe threat to the musk deer's long-term survival. Forest fragmentation not only restricts the available habitats, but weakens the viability of isolated metapopulations. Deforestation causing forest fragmentation is a severe threat to the musk deer's long-term survival. Forest fragmentation not only restricts the available habitats, but weakens the viability of isolated meta-populations. In DNNR, the habitat destruction has undoubtedly influenced the survival of forest musk deer of DNNR, and contributed to the reduction of some populations and, in the long term, may be as serious a threat. Habitat destruction in China has mainly resulted from deforestation.

The Chinese government now pays much more attention to wildlife protection. It has launched a series of laws and regulations to preserve rare animals and their habitats, such as the Wildlife

Protection Law, the Forestry Law and the Environmental Protection Law and so forth. The enacted laws protect musk deer populations to a certain extent. However, illegal hunting has been existing in distributive area including DNNR. Musk deer was illegally killed to harvest the musk sac (Fig.17) which is of high market value.

7. Environmental education and public presentations

7.1 Environmental education and education improvement

Historically, Yi people would not make their child go to school owing to the poverty, and the school is very simple (Fig.105~106). No institution and organization have conducted environmental education except our team. During 2005~2006 when we conducted our 1st Rufford Small Grant project (RSG Ref: 162.01.05: The studies on the conservation of the musk deer and habitat in Dafengding National Nature Reserve of China), we once undertook the intensive environmental education and established the strong foundation for the environmental education and education improvement.

During 2007 to 2008 when the current RSG project was processed, we gathered the pupils once attended our former education and built the project receipt of environmental education, in which many arrivals has been attracted and joined. Moreover, extensive surveying was conducted continuously to explore and work out the relationship of education to such factors as family income, cost of living, household size etc.

On the bases of the experience got in the 1st RSG project conducting, we conducted the many activities in school and villages for a long time (for 3 month) to improve the environmental consciousness and education level of local communities.

Fig.105. Traditional activity for pupil. Photo by Meng

Fig.106. Yi boy and his sister. Photo by Meng
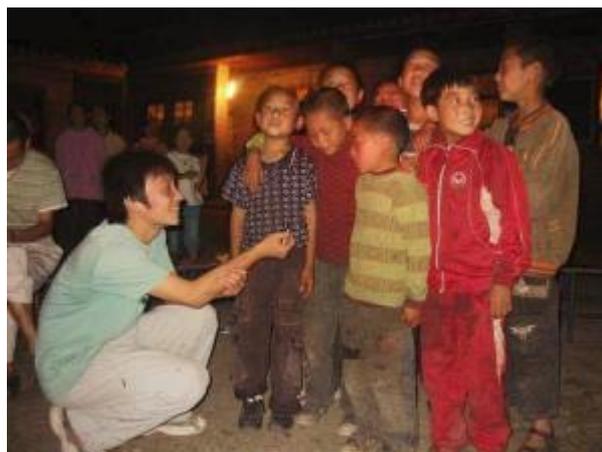
Fig.107. Pupils in local community. Photo by Meng   Fig.108. Pupil and the team member. Photo by Meng

5.2 Education improvement and environmental education in classroom

Under the help from the local school, the local government and communities, enough classrooms were provided to our team. We separated the pupils into different class on the basis of their ages. Our members chose from the undergraduates from the Central University for Nationalities and teachers lectured for them directly, and the teaching contents including Mandarin, English, maths and the environment conservation had been lecturing. Later, the activities even attracted the local officials and the Yi farmers. The audiences felt very happy to our lecturing activities and told us, they have got much knowledge from our lecturing and understood many nature conservation policies. Furthermore, in order to strengthen the friendship of us, we prepared literature repertoire performed at their traditional "Torch Festival".

Furthermore, in our activities we provided many staff including clothes and stationary to pupil to encourage their good activities and excellence. In total, via varieties of publicizing and teaching activities, we not only knew the problem existed in the local environmental and general education, but also make us harmonize with people in the poor minority region and help them raise environmental protection consciousness.

Fig. 109 Cleaning nail in summer. Photo by Meng   Fig. 110 Gaming in winter. Photo by Meng

Fig. 111 Lecturing in classroom. Photo by Hui

Fig. 112 Talking with pupil. Photo by Hui

*Fig.113 Shy children being attracted.
Photo by Zhao*

Fig.114 Interaction among local teacher, team and children. Photo by Hui)

*Fig.115 Children dancing for community.
Photo by Zhao*

*Fig.116 Locals watching their children's activities.
Photo by Zhao*

34
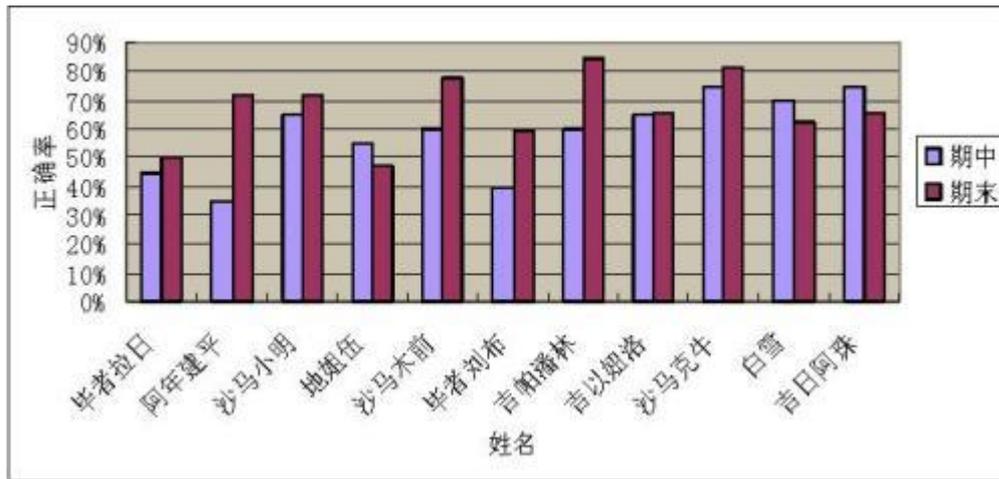
Fig.117 Efficiency analysis of pupils. Made by Sheng

Fig.118 The lowest class of local children joining our activities. Photo by Sheng

7.2 Publicizing in community and public presentations

Based on the intensive experience of our 1st RSG project, we undertook related publicizing in local Yi communities, in which, the topics of wild pig and nature conservation had been publicizing. Through many activities such as lecturing, talking, visiting, movie and public presentation, which were conducted by our team members. Furthermore, we broaden and deepen our public education by the film screening and electrical data such as PowerPoint slides which were related to solid waste, air pollution, flooring, the destruction of biological diversity and other environmental issues. Through our working, the Yi peoples have understood that wild pig is protected wildlife although it may damage their living, and we could utilize the wild pig resources through the ecological farming. Furthermore, they understood the place they are living is our country's wildlife nature reserve and the wild animal protecting is theirs responsibility.

In our public education, the local Yi residents were attracted to learn more about the outside world and aware of their status and their beautiful environment.

Fig.119, Publicizing in local wedding. Photo by Meng

Fig 120, Talking with locals in fire-night. Photo by Hui

Fig.121 First page of Environmental Education Report. Made by Sheng

Fig.122.First page of alternative living style report. Made by Sheng

Fig.122 Talking to the locals. Made by Meng

Fig.123, Talking with the locals. Photo by Meng   *Fig 120, Joining the local gathering. Photo by Meng*

7.3 Paper composing and academic presentation

On the bases of the data collected in current RSG project, we are composing one paper named "Conflict between wild pig and communities in minority regions of South-western China", which will be finished at the end of this year and will submit to the international journal "Biological Conservation", and the RSG Grant will be acknowledged.

Furthermore, in the "3rd National Conference on the Biodiversity Conservation of China" which hold in 20th April in Nanchong City, I made a public academic presentation.

Fig. 121. Conference attending. Made by Hu

Fig.122 Public representation. Photo by Ma

Fig.123 Talking with visiting Russia researcher. Photo by Hui

8. Financial report

(Note: The rate of exchange: 1 £ will exchange 10 RMB or so, which is the Chinese currency.)

Items	Expending
Fee for Guide: 5 £×100×3 guides	£1,500.00
Public presenting, environment education and visiting in Yi People household etc.	£1,500.00
Living provision, accommodation, and equipment such as raincoat, sleeping bag and camp.	£2,000.00
Travel in DNNR	£1,200.00
Travel from Beijing to DNNR	£1,800.00
Total: £8,000.00	
£3,000	**£5,000**
£ 3,000, Fund by "985 Research Project" of Central University for Nationalities.	**Fund from the Rufford Small Grants for Nature Conservation**

9. Acknowledgement

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Composed by: Xiuxiang Meng