Impact of forest ecological system adaptive management on forest farmer livelihood
A Case of Laoshan Forest Farm, Nan jing City of Jiang su Province

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Abstract. With the rapid development of economic globalization, the ecological environment has deteriorated in the world.Lao Shan as the research object, on the basis of analysis on impact of forest ecological system adaptive management on forest farmer Livelihood, This paper put forward that the earlier developed model of forest ecological system adaptive management is not enough to curb the broader economic development of the forest farm.In one hand ecological benefit from ecological forest provide income for Lao Shan development, in other hand seems satisfaction of the objectives sketched by this model. However, forest ecological system adaptive management did not deal about how income from forest trickles to household level, so that economic improvement of household can be achieved.

Keywords：Forest ecological; Adaptive management; Farmer Livelihood

1 Introduction

With the rapid development of economic globalization, the ecological environment has deteriorated in the world, how to effectively protect the natural resources has aroused people's attention. Forest farm Livelihood strategy is primarily based on their accessibility to the natural resources. The land and the forest resources are the determinant factors for the quality of forest farm Livelihood, which possesses ethical, economic and environmental value to the farmer. The forest products provide diversity to the ecological economy and security when times are difficult. These importance have not been realized by the market based commercial forestry as well as government controlled forestry policy. The enclave commercial forestry development model has not been found to use forest's multiple benefits in the welfare of forest households; instead it has widened the gap between poor and rich people. The state led forestry policy was substantially practiced by state control mechanism to increase

state revenue, e.g. under the forest ecological system adaptive management, 2007 in Lao Shan forest farm. As consequences, people were forbidden to access the natural resources and most of the people managed indigenous techniques of forest management were vanished.

However, the realization of these facts during 2007s led to a paradigm shift from enclave commercial or state controlled forestry development model to adaptive management. As a first attempt, This has become the concrete and operational definition for state forest farm in Jiang Su province. Since then, forestry objectives has gradually shifted to the overall eco-economic development beyond mere forest resources demand fulfillment. Now days, forest ecological system adaptive management refers to a wide range of management behavior, which links farmer with forests and benefits derived from it. Recently, organizations such as IPCC have been debating on the policy reform to bring public forest resources to mainstream market economy by finance, investment, taxation, and other market oriented mechanisms. The forest ecological system adaptive management intervention has brought some changes at different levels. Unfortunately, there is a lack of simultaneous eco-economic development. The forest ecological system adaptive management are still struggling due to declining agriculture production characterized by traditional production techniques and subsistence orientations. Consequently, the state is still giving importance to basic subsistence forest needs like wood, fodder, etc. These scenarios have been illustrated below from the available facts that have collected from the case.

2 Study Area

The research Laoshan Forest Farm belongs to Nanjing city in Jiang Su province, neighboring with An Hui provinces. Most of elevation ranks under 200m, only 11 percent of area beyond 200m.Low gully interlocked hills are suitable for the growth of the broadleaved mixed forest,the Quercus,the Cypress,the foreign pine,the pinus Massoniana and the shrubs. (Figure 1) .

Fig.1. The Satellite Image of Forest in Lao Shan

Laoshan Forest Farm which had 3045 inhabitants in 2007 ,including 425 staff and 1000 retirees. Laoshan Forest Farm covers 7031.72 ha of forestry land including 5995.65 ha of ecological forest land. In 2007, the add value in Laoshan Forest Farm is 1.274 million Yuan. The total assets is 12.82 million Yuan and the personal average income is 8374 Yuan. Forestry indsutrial production value constitutes 12.28% of Gross National Product and 87.5% from forestry production in which processed products are 50%.

3 Methodology

3.1 Research Hypothesis

The research attempts to explore the impact of forest ecological system adaptive management on the livelihoods of the farmer. The main hypothesis is that the changes in means of management lead to the changes in farmer livelihood, where people will adopt significantly different living strategies. Forest ecological system adaptive management functions as a means of management model provides new objective to operate forest resources. This leads to eco-economic changes resulting in changed forest farmer welfare.

3.2 Research Method
The area was purposely chosen, as it is a pioneer forestry area in Jiang Su

province. The forest farmer was chosen as the unit of analysis. Of the total number of households (N = 298) in this site, sample households were selected using Systematic Random Sampling. All members' serial numbers divided by two (interval = 2) were taken as the sample (n = 157). Household heads of sampled households were interviewed with structured questionnaire. Two key informant groups, one consisting of farm elderly people, and the other of farmer elites, with 10 members each, were formed to conduct discussion and data were collected regarding the history of the area and other related information. In absence of primary data from the period before 2007, secondary information has been utilized to make comparisons.

4 Previous situation

The dense natural forest that had been used by the local people for their basic subsistence needs was cleared by the state until 2007. Both Commercial and ecological forest were used for forest resources. The nearest national forest was about 5 km away from the farm. Access to national forest was illegal and farmers had to acquire permission from government officials whose field visits were very rare.

Agriculture was subsistence that constituted difficult and less rewarding farm practices such as cultivation of steep and unproductive land. However, few households who possessed both non-irrigated land as well as irrigated had better quality of living with varieties of farm products.

The farmer economy was characterized by farm economy limited to the region and was much less dependent on markets. Crops had greater value than livestock. Exchange of labor, goods, etc, among farm households was of a typical practice. Market was functioning only for their needs that could not be met on the farm. Farmers sell some of their products so that they can afford to buy off-farm products. Fig. 2 shows the household livelihood and resources flow. On-farm activities were the main sources of the farmer livelihood. Off-farm activities were not in practice. Scarcity of forest resources was high. The households seemed to value their forest resources same as the food crops.

The farm had less infra-structural development like road, school, etc. They only had one primary school in study area. Farmerrs usually did not send their children to school. There was only one foot trail linking to Nan Jing city and was made for the tourists linking to Everest base camp.]

5   Impact on forest farm

This situation gradually changed due to the intervention of the forest ecological system adaptive management since 2007. The commercial forestry has changed to ecological forestry and the national forest has changed to protection forest. The management of the forest has been done by the active participation of the government.

The total forest area has been divided to many management blocks. Seventy

percent of the forest is pine and rest is locally available broad leaf. The average age of pine is 20 years and about 1,400 stems per ha have been stocked.
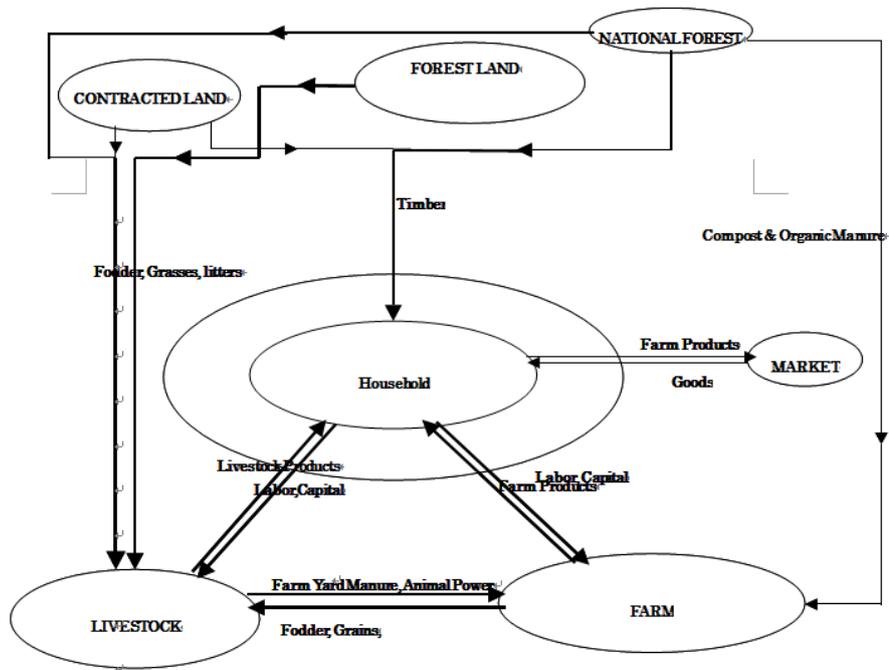

Fig.2. Flow of Resources in a Household in the past

Economic situation of the study area has also been changing over time. The forest ecological system adaptive management has started to pay back to some extent both in cash and kind. The production of forest resources has largely exceeded the ecological demand. The income of the farmer has substantially increased whenever they used marketing opportunities. As a result, this can be considered as a significant achievement. The farmer is going through a substantial economic transition. The expenditures shown in the Fig.2 includes investment on forest management, forest tourism and infrastructure development of the farmers like school building, and road construction. These activities have also generated employment in the farmer. The local level generation of employment opportunities has reduced the seasonal labor migration to some extent. The Fig.3 shows the present situation of flow of resources in a household.
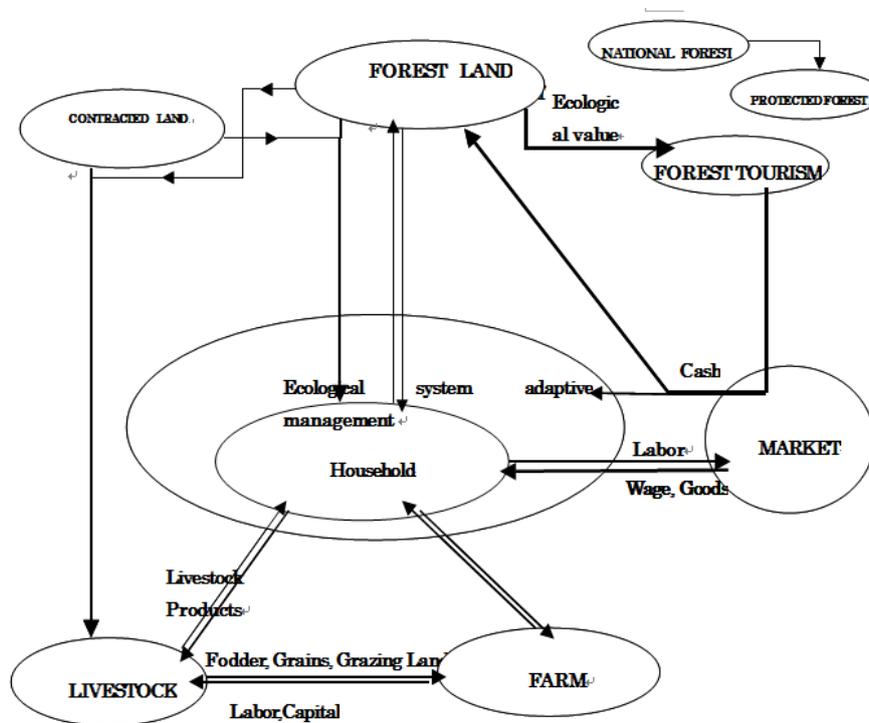
Fig.3. Flow of Resources in a Household at Present

5.1 Dependencies on Forest Resources

Ecological forest are the main sources of forest resources for most of the household, where fodder and bedding material are the most commonly harvested non-timber forest products.

Table 1 Dependency over forest resources

Type/Sources	CL		NF		CL+NF		NR		Total
	HH	%	HH	%	HH	%	HH	%	
Fodder	94	59.9	12	7.6	40	25.5	11	7.0	157
Bedding material	31	19.7	68	43.3	51	32.5	7	4.5	157

(Note: CL= Contracted Land, NF= National Forest, NR= No Response, HH= Household), Source: Field survey, 2011

Fodder: Forest ecological system adaptive management has been providing

fodder to only 7.6% of households (Table 1). About 60% of the households harvest fodder from contracted land only, while the rest (25.5%) depend both on contract as well as forest ecological system adaptive management. A large number of household (45% for tree fodder and 36% for grasses) spend 2 to 3 hours, only 2% of households spend more than 3 hours and 11% spend below an hour to collect a head load of fodder.

Bedding Material: Tree leaf, grasses, etc. are used as a bedding material for livestock. The bedding material is finally used in the farm as compost mixed with animal dung. Over 43% households collect bedding materials from forest ecological system adaptive management, 32.5% household collect from private sources as well as NF, and 19.7% of households depend solely on CL. Prior to the introduction of NF, households solely depended on contracted sources for the bedding material.

The above statistics show a gradual shift in households' dependency for different purposes from contracted sources to forest ecological system adaptive management. Bedding materials are relatively easily accessible resources than fodder. This is partly due to lack of fodder in national forests. About 78% of the household identified fodder as the most scarce forest resource followed by bedding material by 12% (field survey, 2011). The lack of fodder in national forests has to do with the nature of plantation dominated by pine trees.

5.2 Economic change

The previously farm based subsistence economy is gradually changing and off-farm income is playing the central role in the household economy. Fifty-three percent of the household income is derived from off-farm activities. Labor is the main off-farm activity whereas businesses have been reported to some extent in Nan Jing city. About 43% households have earning about 25000 yuan annually from forest-related employment opportunities (Field survey, 2011). The direct impact of this trend has been reducing seasonal migration to some extent. However, this has still been only an occasional source of income. In other words, households could not take it as a stable source of income. The out migration has increased by 10-12% in 2011, while compared to 2006. One member from each household on an average has been migrating to city for some kinds of job. On aggregate, 40% of the total household economy is governed by forest-related income and the rest (60%) is contributed by agriculture, livestock, labor, and other sectors.

6 Conclusions

Substantial economic gain is observed at the enterprise level due to the production from forest ecological system adaptive management. However, such an impact is not observed at the household level. The lower impact at the household level might be due to (1) weak linkage of investment on forest ecological system adaptive management to household level production, and (2) the overall or non-forestry

sectors' development are not in tune with the development activities in the forestry sector. It is likely that underdevelopment of non-forestry sectors made farm less responsive to opportunities given by forest development.

Households seem to have been inadequately rewarded for their ecological forestry. This might have forced them to migrate to city seeking to earn the balance in their household budget. Locally generated employment is the indirect economic benefit to households from forest ecological system adaptive management. However, new employment opportunity happens to be occasional and unstable employment and therefore, less dependent income sources. The employment generation from forest ecological system adaptive management did not impact the permanent labor migration that has been going for at least a few decades.

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