Evolution of Forest Tenures and its Impact on Local Economy
(A Case Study from China)
by
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Abstract
The impacts of county-level forestry, specifically bamboo, reforms on the local economy are examined. In the case of fresh bamboo shoots, by the end of the first phase of land reforms (1987), disincentives associated with the sharing of collective outputs, were eliminated; and allocation of labor and capital inputs reached near optimal. Industrial and market reforms created price incentives, and market reforms had a higher impact on land allocation. In the case of dry bamboo shoots and bamboo timber, production and productivity reached maximum during the first phase of forest land reforms (1983-87), and industrial and market reforms could not maintain the same level of resource-use efficiency. Forest reforms have been able to reduce the inequality in bamboo land and bamboo income, but the share of bamboo income in the total income inequality has increased. It may be desirable to keep the overall income inequalities in sight when designing forest tenure systems. The local governments should consider the basic economic differences in the production of different bamboo products in evolving their land tenures of forestlands.

INTRODUCTION
In the last two decades, China has undergone drastic but gradual policy reforms in search of equity consistent economic efficiency. As a result, China has emerged as an economic giant with an average growth rate of 9.3% (Ruiz-Perez et al. 1999). One of the major policy initiatives is related to land reforms, which has a wide ranging impact due to more than 70% of the Chinese population being involved in land based - agriculture and forestry - activities.

Forests occupy 13.4% of the land base in China (PRC 1996), and the Chinese government has placed a special emphasis on forest resources in their reform process. In fact, in some areas of China, the forest resource is more important than that of agriculture. However, reforms related to forests could not attract the attention to a significant extent. We could only find a few papers such as Menzies and Peluso (1991), Sun (1992), Song et al. (1997), Yin (1998), and these dealt with the forestry sector in general. This paper addresses a specific issue - the impacts of forest tenures on local economy.

We have selected a specific sub-sector of the forestry – bamboo. Availability of research funding shaped our choice. With the establishment of the International Network for Bamboo and Rattan, headquartered in Beijing, bamboo has attracted the attention of researchers. Consequently, two papers by Ruiz-Perez et al. (1996, 1999) are available on the bamboo sector in China. Both studies were focussed on Anji County, Zhejiang Province. Ruiz-Perez et al. (1996) examined the impact of land reforms on bamboo timber production, industrial reforms on bamboo processing, and trade reforms on the export of bamboo products out of Anji County. Ruiz-Perez et al. (1999) examined the role of bamboo plantations in rural development. These papers were unable to address many issues such as the separation of the effect of different reforms on bamboo production, dynamics of income distribution, difference between agriculture and forestry reforms, and micro-level reforms and macro reforms. In addition, the findings of Ruiz-Perez et al. are based on data from Anji County, where the major share of bamboo returns comes from only Moso bamboo timber. Hence, the findings of Ruiz-Perez et al. may not withstand the test of universality. In addition, the other main issue neglected is the impacts of forestry reforms on resources, such as land and labor, allocation among their competitive uses. In this paper, our focus is on the impacts of micro-level (county) reforms on the county economy, segregation of the impacts of different reforms on bamboo production, resource allocation, and the role of bamboo in income distribution.

METHODOLOGY
The information on forest reforms was collected through participatory discussions and documents, such as annual reports and policy papers. General economic and forestry data, and data related to the production and prices were collected from documentation from the county’s forestry and statistical bureaus. To examine the impact of bamboo returns on income distribution, five village groups, consisting of 46 household under the same village government, from Gaohong Township were chosen. Household data on social, economic, and demographic variables were collected a questionnaire survey. Data from 1987 on the same variables from the same households were

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collected from local researchers who conducted a similar survey in 1988.

China, Linan County and Bamboo
China is home to more than one quarter of the world’s total bamboo area and occupies 7 million hectares. Total bamboo area is 2.95% of China’s total forest area, 6.9% of bamboo area is state owned and 93.1% is collectively owned (Zhong et al. 1997). Bamboo plays an influential role in the economy of China, and is sometimes referred to as the “poor man’s timber” due to the availability of multiple entry points into bamboo’s production-to-consumption system (PCS).

Linan is one of the ten counties known as bamboo counties. It is located in Zhejiang Province, which is one of China’s most prosperous provinces, and this is partly due to the predominance of bamboo and ideal agriculture growing conditions. The county has a total area of 313,478 ha, of which 259,500 ha is forestry land. Bamboo shoots cover about 47,000 hectares, 15% of forest area (Zhu 1997, p.176). Standing timber volume is estimated to be 50 million m³. The county has a population of 504,254 people, 87% of which are farmers. Linan County has 39 townships and 665 villages. Linan is considered a middle class county in Zhejiang province. In 1996, the GDP per capita in Linan was 11,534 yuan while that of China was 4,226 yuan. The main bamboo product of the county is fresh bamboo shoots (shoots of *Phyllostachys praecox*, common local name Lei bamboo). The two other products are dry bamboo shoots (shoots of *Phyllostachys dulcis*, *P.vivax*, *P.glabrata* and *P.pubescens*) and bamboo timber from Moso bamboo (*P.pubescens*).

Forestry reforms in Linan county
The main features of the Chinese reforms have been the decentralization of production and investment decisions, increasing use of markets, and the opening of the economy to the outside world (Ruiz-Perez et al., 1996). However, a specific characteristic - decentralization of decision-making - of the Chinese communist regime is almost unnoticed. In March 1981, the government of China introduced the first country-level (macro-level) forest policy reforms. These reforms, named the “3-Decisions”, defined forest ownership as well as forest land user rights and responsibilities for production. The government of China suggested only broad frameworks for these rules, and detailed guidelines by lower level governments followed. However every government attempted to balance efficiency and equity in the evolution of forest tenures.

In Linan county, forestland reforms were started in 1982, and these reforms have a special emphasis on bamboo through multi-pronged efforts such as forestland reforms, monetary incentives, extension, industrial reforms, technology improvement, and market reforms. The forestland was distributed in three different categories: private use land, Farmers Household Responsibility System (FRS) land, and contract land. Private use land is mainly to meet basic subsistence needs of the household, and distribution of land is based on the total population of the household. The area of land distributed under FRS is proportional to the number of workers in the household. The third category of land - contract land - is distributed on the basis of management capacity of a household. Private use lands are inheritable, but FRS and contract lands are allocated for 15 years. These three systems of land allocation are designed to balance equity and efficiency. The primary focus of private use land is on equity, FRS on equity cum efficiency, and contract land on efficiency. In addition to these three forms of farmers’ managed land tenures, there still exist some state-owned farms and collective farms.

As the distribution of forestland continued under these land tenure systems, many problems surfaced concerning the land managed by farmers. With the recognition of these new issues arising out of the initial policy reforms, Hongqiao Township began an experiment on forest tenures which was later emulated by the county government. Based on this experiment, new land tenure policy came into effect in September of 1998. Some of the main features of this new forest land tenure policy are: (i) 50 years period of tenure; (ii) inheriting or transfer of land permitted; (iii) on the expiry of contract, priority to the old contract holder and entitlement of 50% profit for the following 3 years in case of new contract holder; (iv) a security deposit of 20-50 yuan/mu, and (v) the entry of outsiders to contract land. In addition to land reforms, financial incentives and demonstration plots, and extension services, are used to encourage bamboo production.

In 1987, the bamboo-processing sector was opened to private entrepreneurs. As a result, state-owned and collective enterprises, characterized by large debts and declining production, have been increasingly purchased by these private entrepreneurs. However, due to the highly decentralized decision-making at the lower levels of government, different forms of bamboo-based enterprises have emerged.

The prices of bamboo products were entirely controlled by the state up to 1987, and products were purchased by State Marketing Cooperatives, but there was no quota for bamboo products. However, on the entrance of private enterprises into bamboo processing in 1987, there was an increased pressure on bamboo prices, but prices were still determined by the state. In 1990, state price control was removed, and prices became determined by the market.

Hence, the bamboo reforms in Linan County
were initiated in three phases – forest land reforms beginning in 1983, industrial reforms beginning in 1987, and market reforms beginning in 1990. In the latter period of reforms, beginning in 1990, another important change has been the introduction of the new technology, known as covering technology², of FBS.

**Bamboo reforms and the local economy**

The forest policy reforms coupled with other reforms have had a great impact on the local economy. The GDP per capita rose from 1,721 yuan in 1985 to 11,534 yuan in 1996. The average contribution of bamboo to farmers' income rose from approximately one-tenth of total household income in the early 1980’s, to about one-third in 1996. The major portion of the bamboo contribution comes from Fresh Bamboo Shoots (FBS). Within the period of 1983 to 1987, the value of fresh bamboo shoot production increased from 824,000 yuan to over 21 million yuan. In 1994, 1995 and 1996, FBS contribution reached over 100 million yuan, 150 million yuan and 240 million yuan, respectively. As a result, the share of FBS to the GDP increased from about one percent, in early 1980’s, to more than four percent in 1996. Dried bamboo shoot production values also experienced significant changes rising from 0.6 million to 2.8 million in 1983, 5.2 million in 1989, and 7.5 million in 1996.

In 1997, the contribution of the bamboo sector to the economy of Linan County was 505 million yuan, which was comprised of 330 million yuan from bamboo growing, and 175 million yuan from bamboo processing. Bamboo shoots and timber contributed 266 million yuan and 63 million yuan, respectively. In the bamboo-based processing sector, the contributions of shoots and timber were almost equal (87 million yuan from shoots and 88 million yuan from timber). Hence, bamboo shoots constituted approximately 71% of bamboo’s total contribution to the economy of Linan, of which 60% is from fresh bamboo shoots. Due to multiple-entry points for farmers into the bamboo shoot production-to-consumption system (PCS) farmers are able to get higher returns from shoot production compared to that of timber production due to the capital-intensive timber processing.

The new role of bamboo in the local economy is an outcome of the comparative economic position of bamboo products with respect to other land-based products, such as rice, tea, and silk, and this position has been supported by forest policy reforms. The FBS

² A methodology of covering land under Lei bamboo with bamboo leaves, rice or wheat straw, dried grasses etc., which promotes early shooting by raising soil temperatures and increases the productivity of land is known as “covering technology.”

price index in 1996 was 1945.2 (base year 1981) while the next highest price index was 446.0 of rice. The price index of FBS decreased slightly in 1990 and 1995, however these declines were in real price terms. Current prices for 1990 remained similar to 1989 prices but increased in 1995. In 1990, every product price dropped, for tea this decline continued up to 1991, while for silk and rice the decline continued until 1992. Prices of silk and FBS again declined in 1995 and silk and DBS prices declined in 1996. We believe that this relatively higher increase in FBS prices is a result of market characteristics of the four other products (tea, DBS, rice and silk). In Linan County, pricing mechanisms of these four products are still different and demonstrate a different mix of market and government controls. Rice is under the quota system, and hence, there are quota prices and above quota prices fixed by the state. Silk prices are totally controlled by the state and farmers can sell to the State Marketing Cooperatives only. Bamboo products and tea remained under state control up to 1990, and post-1990, prices were determined by the market. However, tea and DBS are mainly export products, hence prices are dependent on world market prices. Fresh bamboo shoots are traded outside Linan County, but export to other countries is almost negligible due to its nature. But the removal of state restrictions on the market increased FBS demand drastically from bamboo-deficient areas of China. In addition, the new covering technology made fresh shoots available during the Spring Festival in early February, when consumers are willing to pay extra-ordinarily high prices. These factors contributed to substantially higher rates of price increases of FBS as compared to other land-based products. The economic factors - high prices of output but the same prices of inputs and increased yields of FBS - put FBS production in a comparative economic advantageous position. On average, the benefit-cost ratios of FBS with rice covering technology, without covering, silk cocoon production, rice, tea and DBS production are 3.6, 2.4, 6.0, 2.0, 1.6, and 1.7 respectively. The net annual returns of production from one mu of land are 3,240 yuan for FBS with covering, 2,350 yuan for FBS without covering, 6,460 yuan for silk cocoon production, 955 yuan for rice, 672 yuan for tea, and 225 yuan for DBS. However, due to specific land features required for FBS production which are similar to the requirements of rice and mulberry (silk cocoon) production, FBS compete with rice and silk for land and not with DBS and tea. For the same reason, DBS competes with tea for land resources. However, there may be competition between FBS and all crops for labor and capital resources.

The land competition between FBS and rice resulted in a continuous increase in the area under FBS, reaching 7,333 hectares in 1996 from 1,867 hectares in
1983, and a decrease in rice to 18,620 hectares in 1993 from 30,640 hectares in 1983. Rice area slightly increased to 19,390 hectares in 1996. However, while there is no apparent competition between FBS and silk, there is some competition between rice and silk. The area under mulberry tree plantation (for silkworm fodder) has increased from 1,440 hectares in 1983 to 2,365 hectares in 1994, but a decreasing trend in 1995 and 1996 reduced it to 1,826 hectares. An interesting feature of land competition is that despite the increase in rice prices, area under rice decreased, and area under FBS increased even during the period when there was a decline in prices of FBS in 1990 and 1995. The main reason for this is, as mentioned above, the comparative advantage of growing FBS over rice growing, and, hence, even a small decrease in FBS prices could not deter local farmers from converting more area to FBS growing. In addition, rice quotas are much less than that of the potential of rice production in Zhejiang province, and hence, conversion of rice area to FBS does not impede village or township governments in meeting their rice quotas. Hence, the passive approach of local governments towards conversion of agricultural land to bamboo production is also an important factor to increases in FBS area. However, the significantly higher price of the FBS index (3-4 times) does not pose a problem to area under mulberry plantations and silk production, and this can be attributable to financial comparability of two crops, labour-intensive nature of cocoon production, and cultural inertia.

Area, production, and productivity of FBS demonstrate marked differences during three periods, 1983 to 1987, 1988 to 1990, and 1991 to 1996. The area under FBS increased at the rate of 216, 422, and 555 hectares/year, respectively, during these three periods. These different rates of increase indicate that the economic incentives, due to residual income, created by the FRS, as well as the economic incentives created by industrial reforms and market reforms, have different impact on the area under fresh bamboo shoots. As mentioned above, FBS prices were state-controlled until 1987. In 1987, the bamboo-based processing sector was opened to private enterprises, and this process increased demand for FBS, and thus, despite prices remaining under state control, there is a marked difference in the increase in prices in 1988 and 1989 as compared to the previous years. Hence, increased demand and higher prices created economic incentives to the farmers to bring their land under FBS cultivation. After 1990, when the state withdrew from the bamboo market, prices jumped by 3 yuan/kg in one year (1990 to 1991), and a similar trend continued in later years, thus reinforcing the price incentives to farmers. Assuming that there are only two factors which can increase the area under FBS, an annual increase of 216 hectares of FBS area can be attributable to economic incentives due to the Farmers’ Household Responsibility System, and 206 hectares and 319 hectares to price incentives during 1988-1990, and 1991-1996, respectively. An assumption that economic incentives due to the FRS would be exhausted by the end of 1987 is unrealistic. In fact, the realistic assumption is that during 1983 to 1987, the only economic incentive in operation was due to the FRS (because prices were controlled by the state) but after 1987, price incentives as well as the economic incentives due to FRS were operative. But in addition to these two factors, financial incentives in the initial phase (1983-87), and new covering technology in the latter phase (1990-96), might have contributed to the increase in FBS area. Hence, we intend to conclude that during the 1983 to 1987 period, increases in FBS area were mainly due to economic incentives from the FRS (coupled with extension services and financial incentives); during the 1988 to 1990 period, the FRS and price effect contributed almost equally, and that during the 1991 to 1996 period, the contributions of price effect, coupled with new technology, and FRS were approximately 60 and 40%, respectively.

The production of FBS has increased continuously from 1420 tons in 1983 to 44,799 tons in 1996. The production of rice is cyclical, showing peaks of 168,235 tons in 1984, 145,730 tons in 1991, and 145,721 tons in 1994, and troughs of 139,818 tons in 1989, and 142,260 tons in 1993. However, the rice production level of 1984 was never regained. The production of silk has increased continuously from 886 tons in 1983 to 3,386 tons in 1994, and decreased to 2,171 tons in 1996. An important point in the production of these crops is resource allocation, and land productivity can provide some indication of resource allocation. The productivity of rice increased from 5.07 tons/hectare to 7.64 tons/hectare in 1993, and then slightly dropped to 7.08 tons/hectare in 1996. The productivity of silk cocoon has almost continuously increased from 0.61 tons/hectare to 1.43 tons/hectare in 1994 and then dropped to 1.19 tons/hectare in 1996. These increases in productivity definitely indicate continuous improvement in resource allocation by farmers. In the case of rice, farmers diverted approximately one-third of their land to other economically better uses, and allocated other resources, such as labor and capital, more efficiently. The case of silk supports the hypothesis that even in the case of a totally state-controlled product market, agents can allocate their production factors efficiently. The productivity of silk cocoon production is dependent upon the productivity of mulberry plantations with respect to leaf production, as well as the cocoon rearing process. Hence, we attribute a major portion of efficient production to efficient labor allocation. Therefore, the
increase in productivity of silk is an indication that people are efficiently organizing their labor resources after the implementation of the FRS.

In the period of 1983 to 1987, FBS production increased at the rate of about 3,887 tons/year, and land productivity increased by almost eleven times, from 761 kg/hectare to 8,675 kg/hectare. This indicates that it was not only the increased amount of land, but also the efficient use of all other inputs, such as land, labor, and capital, which contributed to the increased production. However, in the three years period between 1988 to 1990, there are indications of sluggishness in FBS production and productivity. FBS production increased at a slower rate of 1,667 tons/year in 1988 and 1989, and in 1990, production decreased. Productivity decreased in all three years, and reached 7,141 kg/hectare in 1990 from 8,675 kg/hectares in 1987. This indicates that the increase in land resources was not matched by the required increase in other resources. In the period of 1991 to 1996, there is an interesting pattern in alternate years. Comparative analysis of the production and productivity of odd years (1991, 1993, 1995) and even years (1992, 1994, 1996) shows an increasing trend. Production increased from 19,995 tons in 1990 to 46,000 tons in 1995, indicating an increase of 5,200 tons/year, significantly higher than the rate of increase in the first two periods between 1983-87 and 1988-90. The productivity in even-numbered years increased by 796 kg/hectare (from 7,141 kg/hectare in 1990 to 7,937 kg/hectare in 1996) and by 1,474 kg/hectare in odd-numbered years (7,565 kg/hectare to 9,039 kg/hectare in 1995). The average annual rate of productivity increase is 1,978 kg/hectare between 1983 to 1987, with increases of 737 kg/hectare in the odd-numbered years and 265 kg/hectare in the even-numbered years between 1990 to 1996. The higher increase in the first period (1983-87) is definitely due to inefficient allocation of resources prior to land reforms and higher incentives due to the Farmers’ Household Responsibility System. In the last period (1990-96), it seems that the resource allocation mechanism was influenced by new technology. The slow rate of growth in even-numbered years suggests that the amount of land brought under the new covering technology in the first year (1990) was less than the amount of land in 1991, the second year of the introduction of this technology. This biannual nature is due to the use of the new covering technology in the period (1991, 1993, 1995) and even years (1992, 1994, 1996) shows an increasing trend. Production increased from 19,995 tons in 1990 to 46,000 tons in 1995, indicating an increase of 5,200 tons/year, significantly higher than the rate of increase in the first two periods between 1983-87 and 1988-90. 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of tea and DBS is observed (the correlation coefficient between the tea production and DBS production is -0.40), which indicates some competition for resources other than land between these two crops. The distinguishable point of DBS is that productivity and production have been more than double, even during the worst years of 1992 and 1993, than that of the first two years of reforms (1983 and 1984). This indicates better resource allocation after forest land reforms. Industrial and price reforms do not seem to have had a marked impact on DBS, but land reforms have improved resource allocation. The main reasons behind this may be less over-all economic returns as compared to FBS, the tedious nature of labor required, and the low returns per unit of time invested. Hence, farmers might have viewed growing dried bamboo shoot species as a residual job. The production of bamboo timber (Moso bamboo) also increased from 3.53 million stems in 1983 to 5.98 million stems in 1987, decreased to 1.68 million stems in 1990, and fluctuated between 1.66 million and 3.05 million stems in the period of 1991 and 1996.

Hence, forestry reforms have affected the production and productivity of FBS the most. The land reforms have a major impact in terms of converting more area to FBS growing and efficiently allocating production inputs. It appears that, by the end of the first phase of land reforms (1987), disincentives associated with the sharing of collective outputs based on a work point system, were totally eliminated; and allocation of labor and capital inputs into FBS production reached near optimal. Hence, industrial reforms could effect land allocation, but only through price incentives and could not improve productivity by more efficiently allocating other inputs. Market reforms had a much higher impact through price incentives on land allocation versus industrial reforms, and allocation of other inputs could be improved through new technology. Continuous improvements in the covering technology during the last six years have continued to improve the utilization of labor and capital resources. In the case of DBS and wild bamboo, production and productivity reached maximum values during the first phase of forest land reforms (1983-87), and industrial and market reforms could not maintain the same level of resource-use efficiency, most likely due to the comparative economic advantage of FBS over DBS and bamboo timber.

**The contribution of bamboo, income distribution, and dynamics of income distribution**

In 1987, the total population of the selected five village groups (46 households), was 181 comprised of 104 workers and 75 non-workers. In 1997, the total population decreased to 175, 103 workers and 72 non-workers. However, the ratio of workers to non-workers remained the same. Gender distribution in the village groups remained almost equally divided over the 10-year period with 48% males and 52% females in 1997 compared to the 50:50 ratio in 1987. Total household land increased from 360.9 mu to 392.9 mu, but the land under agricultural crops decreased from 159.4 to 150.5 mu while land under FBS almost doubled from 48.4 to 86.9 mu. Mountainous land also increased marginally by 2.6 mu. The total income of the 46 households increased from 788,102 yuan to 1,007,405 yuan, an increase of approximately 28%. Average household income increased from 17,133 yuan to 21,900 yuan, and per capita income from 4,354 yuan to 5,757 yuan. The bamboo income increased from 138,336 yuan to 274,800 yuan, an increase of about 99%. The contribution of bamboo to the total income increased from 18% to 27% while the contribution of the total primary sector decreased from 42% to 40%. The contribution of the secondary (manufacturing) sector increased from 26% to 40%, but the tertiary (service) sector decreased from 32% to 20%.

On an aggregate, the economy of these village groups became more egalitarian over the ten years period of 1987 to 1997. The distribution of human resources maintained the same level of inequality, but all categories of land distribution became more egalitarian. Reduction in land resource inequality was followed by a reduction in inequality in income from land resources. As a result the Gini coefficient of primary sector income improved from 0.207 to 0.170. The Gini coefficient of secondary sector income improved from 0.307 to 0.243, but the Gini coefficient of tertiary sector income deteriorated from 0.356 to 0.392. However, the aggregate impact on total income has been favorable in reducing the Gini coefficient from 0.155 to 0.133. Hence, the local reforms implemented during this period have been successful in reducing the income disparities generated during the early phases of reform, specifically, bamboo reforms have reduced inequalities in bamboo land and bamboo income. Gini coefficients of different income sectors indicate that the main contributors to income inequality are secondary and tertiary sectors. To confirm this, inter-household total income inequality is decomposed by income sectors. The total weight of agriculture and bamboo together remained the same, but the weight of the primary sector reduced from 42% to 28%, and the main contributor to this reduction is animal husbandry. Hence, even though the Gini coefficient of bamboo income reduced, its share to the total income inequality increased.

4 The relative factor inequality weight of a sector to the total inequality index is equal to cov (Ym, Y)/var (Y), where Y is the total income and Ym is the mth sector contribution to the total income Tsui (1996).
Next, the impact of bamboo income on different income groups is analyzed. The workers to non-workers ratio increased in the top quantile from 1.1 to 3.3 and decreased from 2.0 to 1.3 in the third quantile while in the other three quantiles changes are marginal. The change in area under FBS is characterized by the increase in area (becoming almost double) in four income groups except the poorest section. Agriculture land decreased in the second, fourth and fifth quantiles and increased in the first and third quantiles. Similarly, mountainous land decreased in the first three quantiles and increased in the last two quantiles. As land under agriculture crops was reduced by only 9 mu, a major portion of additional FBS land appears to have come from the new allotment of land to households from collective lands. As mentioned in the policy reforms section, the main objective of reforms was equity consistent efficiency, thus the new allotment of FBS land reduced FBS land inequality. Subsequently, the Gini coefficient of FBS land reduced from 0.324 in 1987 to 0.232 in 1998. The changes in agricultural land and mountainous land were marginal, thus the reduction in inequalities in these categories was also marginal compared to that of FBS land. However, due to the economic attractiveness of FBS as a crop, and the possibility of contracting limited land in addition to land allocated under FRS, the area under FBS remains characterized by the highest inequality as compared to agriculture or mountainous land.

During ten years period, the contribution of the primary sector to the total income decreased by 24% in the richest group, increased by 13% in the second group, while in the next three groups it changed by only 1% or 2%. In 1997, the primary sector is dominant in the lowest two income groups; in the third quantile, the primary sector and manufacturing sector contribute almost equal; in the second quantile, the manufacturing sector has the highest share, but the primary sector continues to contribute almost 40%; and in the richest group, only 27% is from the primary sector and the maximum share is from the tertiary sector. An interesting feature is that the contribution of the secondary sector increased while the tertiary sector decreased across all quantiles. In 1997, the fourth quantile received 31% income while the second quantile 48% income from the secondary sector. Hence, industrial reforms have benefited all income groups.

In the case of the primary sector, the contribution of agriculture decreased but the contribution of bamboo increased in all groups. As previously mentioned, the contribution of bamboo increased from 18% to 27%, this outcome is different from Ruiz-Perez (1999) where the contribution of bamboo remained almost the same over six years period. In 1987, the bamboo contribution was highest (18%) to the two lowest groups and it continuously decreased to 9% for the highest group. Hence, its shape is not convex, hence, it is different from Ruiz-Perez (1999). In 1997, the contribution of bamboo became highest to the second (33%) and forth quantiles (32%), and poorest group received 26% while the richest 22%. Hence, again the shape is not convex. In terms of percentage change, the second quantile has the highest increase (11% to 33%) followed by fourth quantile (18% to 32%), and the poorest section also has an increase of 8% while the richest group has an increase of 13%. Hence even though the increase in bamboo income may be highest to the second quantile, but the poorest group still gets 26% and the fourth quantile gets 32% income from bamboo. Therefore, in this case, the contribution of bamboo is still critical to the poor section. Even though, bamboo is contributing 22% to the richest group, but out of four households who were in this group in 1987, only one household was able to maintain placement in this group in 1997. Hence, the analysis of bamboo contribution to different income groups is incomplete without understanding the movements of households from one income group to other groups.

The rich and poor households are not static. As mentioned above, only one household could maintain its status in the richest group. Similarly, two out of six, one out of seven, four out of ten, and ten out of nineteen households remained in the second, third, fourth, and fifth income quantiles. The ten households who remained static in the poorest class, the “poorest of the poor”, are put to the detailed analysis.

The ratio of workers to non-workers (1.1) for this group of the poorest ten households is less than that of all the households (1.4), which adversely affects these households. The total land to these households decreased from 71.9 mu in 1987 to 58.9 mu in 1997. Even bamboo land decreased from 11.9 mu to 8.5 mu, but the actual distribution of bamboo land did extend from only six of the ten households to all ten households. The total income of these ten households increased from 90,050 yuan to 121,800 yuan, indicating a 35% increase against a 28% increase at the village level. The contribution of bamboo almost doubled from 14,520 yuan, spread over four households, to 27,500 yuan, spread over eight households. This is the same level of increase as at the village level. The percent contribution of bamboo increased from 15% to 23% and agriculture decreased from 18% to 13%. The total contribution of the primary, secondary, and tertiary sectors changed from 39%, 26%, and 35% to 39%, 42%, and 19%, respectively, reflecting a similarity to all of the households. Thus, even this poorest section receives the same share of bamboo income (23%) as that of the third quantile (the middle income group). Hence, even with limited bamboo land resources, the
proportional change in returns from bamboo has been equal to the aggregate level. The smaller contribution of bamboo to total income is not due to the unimportance of bamboo to this group, but rather due to a bias in county land allocation policies which favor workers over the total number of people in household. Hence, on the village level, Income distribution demonstrates that in 1987, the contribution of bamboo was the highest (18%) to the income of the two poorest quantiles, and in 1997, the lowest quantile received about one-fourth (26%) and the fourth quantile received about one-third (32%) of their income from bamboo. The aggregate contribution of bamboo has increased from 18% to 27%, and has benefited the wealthy as well, but the distribution of bamboo income is not biased in favor of the middle class (as found in Anji County). Bamboo income has also played a critical role in moving many households from the poorer classes to the richer classes. In the case of the poorest of the poor, bamboo contributes about 23% to the total income. The share of bamboo to this group is less than that to other groups due to the demographic composition, and demography dependent land allocation. Hence, it is not the case that bamboo is not a poor man’s product, but rather that land policies have restricted the returns to this group.

FINAL COMMENTS

In Linan County, forest land, industrial production and market reforms, as well as other initiatives such as extension, new technology, and the establishment of bamboo associations, have all contributed to enhance the role of bamboo in the county’s economy. However, the impact of these reforms has been mainly on fresh bamboo shoots, while dried bamboo shoots and bamboo timber have not been affected to the same extent. Hence, the privatization of use and management decisions under FRS may be optimal for FBS due to its similarity with other agriculture crops and not for other forest crops. Therefore, the local county and village governments should extend their experiments on forestland tenures beyond addressing the economic incentive and tenure security problems.

In Linan County, the contribution of bamboo to the poorest sections is different than the contribution of bamboo in Anji County. Thus, it appears that the hypothesis of using bamboo to improve the economic condition of poor people cannot be rejected on the basis of one or two case studies. However, our data also does not support the theory that returns from bamboo go to poor people only. Hence, we believe that the contribution of bamboo to different income groups will be specific to both the product and context. In Linan County, the share of bamboo to the poorest of the poor has not increased to the same level as higher groups, it is due to the adverse effect of forestland reforms on the households who have less workers than non-workers. Hence, to bring such households on equal footing, land policies must either be modified or some other financial measures should be started.

Finally, forest reforms have been able to reduce the inequality in bamboo land and bamboo income, but the share of bamboo income in the total income inequality has increased. Hence it may be desirable, in the long term, to keep the overall income inequalities in sight rather than the inequalities in the forest sector when designing forest tenure systems.

LITERATURE CITED


