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RURAL LABOR MIGRATION, CHARACTERISTICS, AND EMPLOYMENT PATTERNS: A STUDY BASED ON CHINA'S AGRICULTURAL CENSUS

Francis Tuan
Economic Research Service, U.S. Department of Agriculture

Agapi Somwaru
Economic Research Service, U.S. Department of Agriculture

Xinshen Diao
International Food Policy Research Institute

Trade and Macroeconomics Division
International Food Policy Research Institute
2033 K Street, N.W.
Washington, D.C. 20006, U.S.A.

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Abstract

Continued industrialization in China and increase in its agricultural productivity imply that surplus rural workers will to be attracted into non-agricultural production activities and, consequently, will have the opportunity to increase their off-farm income. Studying the structure of the rural labor force and its characteristics is important for evaluating its migration potential into non-agricultural sectors. This study examines the rural labor market in China exclusively based on China's first national agricultural census. We analyzed the demographic characteristics of the rural labor force and their association with the type of employment, place of work, and labor migration. Furthermore, we investigated demographic distributions of rural labor force and attempted to capture their relation with the distribution of other resources especially land availability or land constraints.

We finally applied a generalized polytomous logit technique to analyze the patterns of rural labor employment and forecast rural migration. In this framework, we related rural labor migration with demographic characteristics, types of occupation, place of work, geographic characteristics, and various economic development indicators.

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1. Introduction

Given limited per capita cultivated land in China and low rural incomes, the reduction of surplus agricultural labor is an important goal of China's economic development policy. Growing employment opportunities in industrial and service sectors are expected to absorb surplus agricultural labor, raising agricultural labor productivity, improving rural incomes and reducing rural poverty. Furthermore, Chinese policy is to encourage the creation of new jobs in rural areas to prevent massive rural-urban migration that has overburdened cities in many developing countries. Thus, analyzing the structure of the rural labor force, its characteristics, and its potential for migration to non-agricultural sectors is essential to understanding and guiding China's economic development.

Since the start of economic reforms in 1978, China has experienced the largest labor flow from primary industries to other sectors of the economy. As China's economic development advances further, migration of rural labor to urban industrialized areas is certain to occur. Even though significant labor migration from agricultural to non-agricultural activities has taken place in recent years, a large share of China's population is employed in agriculture on a small land base. Data from China's first agricultural census indicate that more than 65% of the rural active labor force aged 16-60 is still engaged in agricultural activities in 1996. Among them, 53% of rural persons spent more than 6 months of their time on farming, while about 9% worked less than 6 months per year in agricultural activities. The size of land holdings is still quite small, averaging around 1/3 hectare per household. As a result, productivity and income per agricultural worker are quite low. Large income differentials between agricultural and non-agricultural employment provide strong incentives for labor to move to the non-agricultural sector, but a number of barriers to non-agricultural employment prevent the movement. Among the barriers are the lack of non-farm industry in rural areas, the household registration system that constrains migration to urban areas, low education or rural residents, and land tenure system that prevent efficient reallocation of land to take advantage of size economies and other efficiencies.

Many studies have been conducted and much research effort has addressed these arguments. Carter (1997) argues that China's rural labor force engaged in agriculture is rather high when examining its agriculture share of GNP. He states that the percent of rural workers engaged in agricultural activities is high when compared with other countries with the same income level. He argues that institutional and policy-influenced restrictions prevent rural workers from engaging in non-agricultural employment. Rozelle, et al. (1999), however, find no evidence of policies preventing rural labor migration. Instead, they argue that there is evidence indicating tremendous labor movement out of agriculture over the period 1988-98. Also, Parish, et al. (1995), remarks that a rural labor market is clearly emerging in China. They state that the rural labor market transformation is on its way but its speed is slow given the complexities of the marketization process.

This current study examines the rural labor market in China, its characteristics, possible restrains, and potentials for migration using newly available data the first national agricultural census conducted since the founding of the People's Republic of China. Previous studies on these issues are either based on aggregate statistical data or on small sample surveys that cover limited geographic areas. The national census provides us with a unique opportunity to comprehend the structure of rural labor in China on its entirety. The census covers all Chinese persons and households in rural areas, non-household agricultural production units, township enterprises, as well as administrative organizations of all villages and towns. This study is based on 1% sample of the 200 million households enumerated by the census. We analyze the demographic characteristics of the rural labor force and the possible association between rural labor's type of employment, place of work, and labor migration. We estimate demographic distributions of rural labor force and attempt to capture their relations to the distribution of other resources, especially land availability or land constraints. In an attempt to capture the dynamic trends of rural labor force we apply and estimate a generalized polytomous logit (GPL) model to analyze the patterns of rural labor employment and gauge rural migration.

The paper is organized as follows. The next section presents an overview of the rural labor force and its characteristics, followed by an analysis of rural persons and households. This analysis focuses primarily on full time rural persons engaged either in agricultural or non-agricultural activities. The following section concentrates on the composition, main demographic characteristics and distribution of rural persons by the type of their economic activities. Section 4 associates land scale, regional level of economic development, and their relationship with labor migration. Section 5 uses a statistical procedure, a generalized polytomous logit model, to analyze and predict future movements of rural workers from agricultural to non-agricultural activities. The paper concludes with a summary.

2. Overview of Rural Labor in China

The number of rural persons engaged in agricultural and nonagricultural activities is rather high, with the "economically-active" population amounting to 76.2% of the total rural population. The term "economically-active" population refers to the population that is able to engage in labor. This includes both actual and potential laborers as well as those who are unemployed. In other words, all rural persons of working age as well as those capable of engaging in economic activities, as defined by China's first census of agriculture, are considered as the economically active population in rural China. In this study however, we grouped the rural persons into three distinct categories for capturing and analyzing the potential for migration of the economically active rural persons. The first group includes persons of age 16 and younger, the second includes persons 15-60 years old, the last group includes persons above the age of 60. Our analysis focuses primarily on the second group.

2.1 Size and Growth

Survey statistics compiled prior to the Census indicate that the number of employed persons in China has been increasing since 1978, and the proportion of persons employed in agriculture has been decreasing. In 1996, 48 percent of employed persons were engaged in agriculture, down from 71 percent in 1978 (table 1). Since the reform policies were adopted in the late 1970s and early 1980s, the rural economy has developed in many directions. The proportion of persons engaged in non-agricultural activities has increased with widespread migration of rural farm labor to non-agricultural employment. By the end of 1996, there were 561.5 million rural persons engaged in economic activities. This included 498.9 million persons of working age and 62.6 million persons below or over working age.

Table 1: Number of employed persons and proportion engaged in agriculture (in millions)

	1978	1980	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Rural/Total	71%	69%	62%	61%	60%	59%	60%	53%	54%	53%	51%	50%	49%	48%
Total	401.5	423.6	498.7	512.8	527.8	543.3	553.3	639.1	648.0	655.5	663.7	672.0	679.5	688.5

Source: China Statistical Yearbook 1998

Based on the Census, the number of rural households engaged in production activities is 213.8 million. The number of persons per rural household average 3.66, but the number of persons engaged in agricultural economic activities is 2.65 per household. Overall, 73.2 percent of rural persons between the age of 15 and 60 are engaged in agricultural activities, while 26.8 percent are engaged in non-agricultural activities. For the same age group, however, only 10.6 percent are engaged full-time (worked more than six months) in non-agricultural activities as full-time workers.

3. Rural Labor Force

This section we present the main features of rural persons between the ages 15 to 60 for males and 15 to 55 for females who are engaged full-time either in agricultural or non-agricultural activities. These two distinct groups represent the two polar groups that our analysis is centered upon. According to the Census, persons who worked full time in agricultural activities and were not engaged in any non-agricultural activities account for 52% of all rural persons. On the other hand, only 11.4% of rural persons are engaged in non-agricultural activities full time (worked more than 6 months) in non-agricultural activities and are not engaged in any agricultural activities. We also distinguish a third group, which includes persons who work full-time but part-time in agricultural and part-time in non-agricultural activities. We label this group "full-time, part-time agricultural & part-time non-agricultural" activities. According to the Census, this group accounts for 10.3% of all rural persons. With this third group we attempt to capture the "transitional" characteristics of the rural people as they are engaged and potentially can move to full time non-agricultural activities.

3.1 Age Composition

Rural persons engaged full time in economic activities are mainly young persons, who account for 47 percent of the total rural population and 65 percent of the rural "economically active" persons are engaged, either full-time or part-time, in production activities. This implies that the remaining 35 percent of the rural population are either very young (school age) to be engaged in any economic activity or unemployed.

The distribution of rural labor employed full-time in agricultural and non-agricultural activities is depicted in figure 1. We also include the distribution of total rural labor force for comparison reasons. Figure 1 clearly indicates that rural persons engaged in non-agricultural activities are much younger, between 16 and 30 years of age, compared with full-time rural persons engaged in agricultural activities. The age distribution of full-time agricultural persons (and/or workers) exhibits the same pattern as that of all rural persons engaged in agricultural activities. Taking into account the time when the rural reforms were established in China, it comes as no surprise that the distribution of full time non-agricultural persons is dominated primarily by young persons who capitalized on the opportunities offered by the reforms. This also reflects the economic climate and stimulus generated by the rural reforms, which increased non-agricultural employment opportunities for rural persons, especially for the younger rural economically active population. The same distribution by economic region reveals regional differences (figures 2 and 3), but they follow the same patterns as that of the national level for both agricultural and non-agricultural employment. That is, young rural persons, between the age of 16 and 30, are mostly involved in full-time non-agricultural activities compared with older persons in the same regions and for all three regions.

Further statistical analysis indicates that the distributions of the rural persons engaged full-time in agricultural and non-agricultural activities by age are quite different. The age distribution of the persons employed full-time in agricultural activities is a Johnson SB distribution (see figures 4) with lower endpoint quartile estimate 0.18443 and upper point quartile estimate 7.0724. On the other hand, the age distribution for the persons engaged full time in non-agricultural activities follows the normal distribution (see figure 5) with mean 2.22 and variance 0.5786. This difference in distribution is another reason indicating the distinct contrast between these two groups.

The estimated distributions by the main economic regions are also quite interesting. In the East region, the distribution of rural full-time agricultural persons by age follows a Weibull (E) distribution with quartile estimate 0.83137, scale maximum likelihood estimate 1.55888, and shape maximum likelihood estimate 1.89946 (figure 6). For the same region the distribution of non-agricultural employed persons follows a Johnson SB with lower endpoint quartile estimate 0.16968 and upper endpoint quartile estimate 5.80884 (figure 7). In the Middle region the distribution of the full-time agricultural employed persons follows an Extreme Value Type B distribution with mean 2.212 and variance 0. 754 while the distribution for non-agricultural employed persons is a Johnson SB with lower endpoint quartile estimate 0.21922 and upper endpoint quartile estimate 8.44490 9see figures 8 and 9). Finally, in the West region the distribution of

full-time agricultural employed persons follows a Weibull (E) distribution with location quantile estimate 0.94221, scale maximum likelihood estimate 1.40833, and shape maximum likelihood estimate 1.49114 (figure 10). For the same region, the distribution of full-time non-agricultural employed persons follows a Johnson SB distribution with lower endpoint quartile estimate 0.23677 and upper endpoint quartile estimate 9.29766 (figure 11). The *scores* reported in figures 4-11 capture the goodness-of-fit while formal tests were performed to verifying the good fit.

The above formal analysis of the distributions clearly indicates that distinct characteristic differences indeed prevail among the various types of labor force at the national as well as at the regional levels. Future analysis of the factors affecting the main moments of the distribution, such as the mean and variance, would allows us to identify the forces affecting the various distributions.

3.2 Does Education Matter?

In order to increase our understanding of the relationship between employment and age (or education) we examine the characteristics by age and education level. The distribution of rural labor force employed full-time in agricultural and non-agricultural activities by age group and education level (see figure 12) clearly supports the hypothesis that the education level of a person is strongly associated with non-agricultural activities. In figure 12 we present the distribution of rural persons who engaged full time in agricultural, full-time in non-agricultural activities, and those employed "full-time, part-time in both agricultural & non-agricultural" activities. For reasons of simplicity we classify the education level into four categories: the first category is the *primary or elementary* level, which includes literate, illiterate, and primary education levels as reported by the Census. The second category includes the *junior middle* level *or middle school*, and the third category is the *senior middle* level or *high school*. Finally, the fourth category includes the *special secondary school and college* levels, which combines these two levels as reported by the Census.

The figure 12 indicates 50 to 85 percent of the rural persons engaged in full-time agricultural activities fall into the primary level of education. However, for the same full-time agricultural group there is a clear difference between the younger (age 16-35 years old) and older (age above 35 years old) persons. The younger group's educational level is 50 percent primary and 50 percent junior middle school. On the other hand, more than 80% of the older group's education is at the primary level. This indicates that the younger persons who are involved in agricultural activities full-time are more educated than their older counterparts. Furthermore, the younger generation looking for better employment opportunities has already received more education than the older generation. Since education and training are the primary vehicles that can equip individuals with the skills needed to be engaged in non-agricultural employment activities, the younger generation is better prepared to work outside of agriculture. This is captured by the distribution of education of those engaged in non-agricultural activities either part time (*full-time, agricultural & non-agricultural activities*) or full-time. Figure 12 clearly indicates that the educational level of these two groups is much higher than the level of

the full-time agricultural employed group. The same figure also depicts that the educational level of persons employed full-time in non-agriculture is higher (special training and college level) than the level of the full-time agricultural and non-agricultural group. This implies that to further enhance opportunities for rural labor to move into non-agricultural employment higher education and extensive skills' training might be the prerequisite for achieving this goal. Higher education and/or secondary school training develops the skills needed for non-agricultural activities.

3.3 Gender

There are 307.1 million male rural workers (51.5 percent) and 289.1 million female rural workers (48.5 percent) between the age of 16 and 60 years old engaged in economic activities in China. According to the Census, the economically active male population includes ages from 16 to 60 while for females the range is between 16-55 years old.

In order to enhance our understanding of the rural labor force in China we depict the distribution of rural persons by gender and age groups. Figure 13 presents the distribution of rural labor force by age, gender, and by categories of economic activities. The distributions clearly indicate that rural young males are more likely involved in non-agricultural activities than are females. In other words, females independently of age group are more likely than males to be employed full-time in agriculture. This might be due to many farmers extending preferential treatment towards boys in providing educational and other opportunities that lead to employment outside agriculture in rural China. When both males and females are engaged in full-time non-agricultural activities, the dominance of the young males fails to prevail for the youngest age group (age between 16-17 years old). In this group young females are extensively involved in non-farm employment activities on a full-time basis at a rate equal to that of young males in this age group. The gender difference may also be an issue of farmers being afraid to lose the use rights on their land if the entire family migrates to non-agricultural activities. Since land is a traditional valuable resource for rural households, most rural males are seeking full-time off-farm opportunities while females are involved full-time with agricultural and/or part-time nonagricultural activities at nearby places and it is not necessary or impossible for the whole family to leave home.

3.4 Education and Gender

The distribution of rural labor force by gender, educational levels, and categories of economic activities (see figure 14) supports the notion stated above that males in the three employment groups are more educated than females. Full-time employed males in agricultural activities are more educated than female. Also, in this group, 60% of primary educated persons are females. When it comes to full-time agricultural and non-agricultural group and full-time non-agricultural employment, males dominate in all levels of education (65%-75%).

In sum, younger rural persons employed full-time are more educated than older persons (whether they are in agricultural non-agricultural work). Also, males are more educated than females while females are largely consigned to the full-time agricultural activities.

4. Household Characteristics

In this section we present the relationships between rural persons and rural households. A rural household is defined by the Census as a household that lives in rural areas for a long time and is engaged in productive economic activities. This includes households that have lived in the locality for more than one year whether or not they have registered there. Households that registered in the locality but absent for more than a year are excluded even if they hold the contracted land.

4.1 Households and Land Distribution

Over the last two decades, China has been observed a series of successful economic reforms on its agriculture and rural economy. After the collective production system was replaced by the rural household responsibility system (HRS) in the early 1980s, farmland has been mainly cultivated by individual households who make decisions about planting as well as the use of inputs (Ownership rights of land are still nominally held by collective organizations). The Census shows that there are about 200 million rural households engaged in agricultural activities in 1996. The cultivated land area per household is often quite small. Moreover, the distribution of land is believed to be quite egalitarian as land is contracted to each individual household according to the numbers of family members and workers.

Surprisingly, the Census shows that the size of land holdings varies among households, whether measured per household or per worker. Based on the size of holdings, we divided all rural households into 10 *land size* groups. In the first group, there are about 10% households holding less than 0.07 hectares of land (with an average of 0.046 hectares per household). In the tenth group, there are 1.6% of households and the size of land holdings is above 2 hectares (3.2 hectares on average). This implies that households in the tenth group hold, on average, 70 times more land than those in the first group. Based on this finding, we further develop a land Gini coefficient and the Lorenz curve to illustrate it. The Lorenz curve is often used to describe income distribution among households or persons and the measures the degree of income inequality while the distance between Lorenz curve and the 45-degree line captures the income distribution inequality (Gini coefficient). Based on this concept, we use the average land holdings for each of the 10 land size categories versus the percent of the households and the percent of workers in each group to describe the disparity in land distribution (see figure 15). The Gini coefficient for the households is 0.51 while the Gini coefficient for the workers 0.46. The values of the coefficient for both distributions indicate that land is not equally distributed among either households or workers but is relatively more equally distributed for workers than households.

4.2 Land Size Affects Household's Agricultural Employment

Family members are the dominant source for China's agriculture, regardless the size of land held in each household. The Census data only capture a small number of permanent and temporary hired workers (averaging 0.02 and 0.03, respectively) per household, and among them, the hired permanent and temporary agricultural workers are 0.013 and 0.004 per household. Such small numbers may reflect the fact that labor exchange instead of hiring is likely the main channel for Chinese farmers to employ non-family workers during busy seasons of agricultural production, such as plowing and harvesting.

Since there variation in size of land holdings per household, we might expect members of households with small holdings to have more time for off-farm work. For those households who hold less than 0.07 hectare (1 mu) of cultivated land, only 29% of family workers are engaged full-time in agricultural activities. In this group, non-agricultural employment is high, as more than 54% of family workers are mainly involved in non-agricultural activities. However, once the land scale per households increases to more than 2 hectares (30 mu), 72% of family workers are full-time in agriculture, while non-agricultural employment falls to 5% of its total labor force.

4.3 Labor Use Intensity and Land Size

Part-time agricultural workers, who worked mainly in agriculture, but not full-time accounted of 16 – 23% of the total family workers per household. Some of them are also involved in part-time non-agricultural activities. According to the Census, all household members are asked to report how long in 1996 that they engaged in agricultural and non-agricultural activities, respectively. There are six time ranges for workers to choose for both agricultural and non-agricultural activities in six ranges: 0 month, 0 - 1 month, 1 - 2 months, 2 - 4 months, 4 - 6 months, and more than 6 months of a year. There are 36 different combinations for time spending among all labor employment categories. We further converted all part-time agricultural employment into full-time. We first calculated the months engaged in agricultural production for all rural households by land holding group, and converted these times into full-time (more than 6 months) agricultural workers by group. We then divided the total cultivated land of each group by the converted full-time agricultural workers for each group. The results show that the smaller the size of land by a household, the more labor intensive the crop production in the household. For the first size group in which all households hold less than 0.07 hectares of land, the ratio of land and full-time agricultural workers is 0.5 hectares per worker. This ratio rises to 17.6 hectares when the size of land held by a household increase to more than 2 hectares. This implies that, on average, the households who own the smallest size of land holdings employed 35 times more labor per unit of cultivated land than those with large scale of land holdings. This finding shows that the workers in the smaller size group may be engaged in more labor-intensive crop production, but the dramatic difference in the land-labor ratio suggests that the small scale of land may lower their labor productivity. Their productivity in agricultural work

would be even lower if members of households with small land holdings were not devoting such a large portion of their labor to non-agricultural employment.

4.4 Part Time Labor is Dominant

About 35 percent of the rural labor population are more or less involved in some degree in non-agricultural activities. However, full-time non-agricultural employment accounts for less than one-third of the rural active labor force. According to the Census, persons who worked part-time (less than six months) and had both agricultural and non-agricultural activities account for 7.2% of the total rural persons. Finally, persons who mainly work in agricultural activities but spent some time (most cases less than 2 months) in non-agricultural activities account for 6.0% of rural persons. This classification allows us to identify the migrant labor force and capture the movement of rural labor from agricultural to non-agricultural activities. According to the Census, the majority of persons/workers and families do not participate in permanent migration even though they have the ability to migrate. This finding is also in agreement with other studies based however on surveys (see Zhao, 1999).

Agricultural activities by nature require intensive use of labor during certain months for planting and harvesting. This should be taken into consideration when it comes to identify the type of employment as well as part-time vs. full time work. It is also a fact that under the production-linked contract responsibility system, land is distributed according to the number of persons in each household, and members of the household are expected to cultivate this land.

5. Rural Labor Migration

We investigate the rural labor migration empirically by applying a Generalized Polytomous Logit (GPL) function to handle the discrete not ordered choices of the employment (Greene, 1990; Kennedy, 1992; Long, 1997; Stokes et al., 1998). The probability that a rural person will choose one of the *m* alternative classification of employment, Φ_i, i=1,..,m, is given by:

$$(1) \qquad prob\ (\frac{\Phi_i}{\Phi}) = \frac{\exp[\ U\ (\Phi_i)]}{\sum_{j=1}^{m} [U\ (\Phi_j)\ ]} = \frac{\exp(\ x_i b\ )}{\sum_{j=1}^{m} \exp(\ x_{ij} b\ )} i \neq j$$

where $U(M_i)$ is the utility for alternative M_i, x_i is a vector of variables that affect the type of employment, and $ is a vector of parameters. The probability that a farmer will choose a particular classification of employment is given by the probability that the utility of that state or category of employment is greater than the utility from any other available alternatives. In other words, the farmer selects the alternative category of economic activity that maximizes his/her expected utility. The alternative employment

classifications available to farmers specified in this study are: full-time agricultural activities, full-time employment but part-time in agricultural and part-time in non-agricultural activities, and full-time non-agricultural employment. Although, there are other classifications of employment, as we mentioned previously, however, the three specified account for most rural persons. We could include all classifications but instead we try to keep the analysis simple and generate meaningful results. The explanatory variables include: age, gender, education level, size of the household measured by the number of persons in each household, and available land for each person that falls into the above three categories of employment. Since the response variable, the choice of employment, has no inherent ordering, we estimate the model as a generalized logit function. The logit of the response variable is formed as a ratio of the probability of choosing an employment classification over the probability of choosing the reference one:

$$\text{logit}_{\text{hijk}} = \frac{\log(\eta_{hijk})}{\log(\eta_{hijr})} \tag{2}$$

where k = 1, 2, ..., (r-1) indexes the choice of employment categories, r is the reference choice or the choice used as the basis for comparison, h, i, and j reference the explanatory variables, and θ_{hijk} is the probability of the k^{th} choice, given by:

$$\eta_{hijk} = \frac{\exp(\alpha_k + x_{hij}\beta_k)}{1+\exp(\alpha_k + x_{hij}\beta_k)} \tag{3}$$

or η_{hijk} represents equation 1 above. A logit of the response variables under consideration is formed for the probability of each employment classification over the reference classification. For example, the generalized logits for a three-level nominal response where the rural person chooses among three different employment categories can be specified as follows:

$$\text{logit}_{\text{hij1}} = \frac{\log(\eta_{hij1})}{\log(\eta_{hij3})}$$

(4)

$$\text{logit}_{\text{hij2}} = \frac{\log(\eta_{hij2})}{\log(\eta_{hij3})}$$

where category 3 is the reference choice. The model that applies to all logits *simultaneously*, accounting for every combination of the explanatory variables, is as follows:

$$\text{logit}_{\text{hijk}} = \alpha_k + x_{hij}\beta_k \tag{5}$$

where k indexes the choice of the product. The matrix x_{hij} is the set of explanatory variables for the hijth group. This model accounts for each response by estimating separately the intercept ($"_k$) and the set of regression parameters ($\$_k$) for all explanatory variables. That is, in the GPL model specification, we estimate simultaneously as a panel multiple sets of parameters for both the intercept and the explanatory variables.

The interpretation of GPL parameter estimates is not very straightforward, as both dependent and explanatory variables are mostly categorical. To facilitate the interpretation of the model parameters, we estimate probabilities and odds ratios. The predicted probability that a particular work category is chosen is a function of the estimated model parameters given in equation (5). Odds ratios are obtained from the predicted probabilities (Stokes et al., 1998). To obtain the odds of choosing category k, for examples, by a young male worker relative to a old male worker, we compute:

$$\text{(6)} \qquad \text{odds ratio} = \frac{\exp(a_k + x_{hij}\beta_k)}{\exp(a_k + x_{lij}\beta_k)}, \qquad h \neq l$$

where h and l are reference age groups. The odds ratio is a multiplicative coefficient, which means that positive effects are greater than 1, while negative effects are between 0 and 1. Determining the effect of the odds of the event not occurring involves taking the inverse of the effect of the odds of the event occurring (Long, 1997).

For the GPL model, we group the explanatory variable age into three categories of rural persons: group1 including persons between 16-22 years old, group2 persons between 23-35 years old, while group3 all rural persons older than 35 years of age. The explanatory variable land is grouped into four categories according to the land distribution by persons: group1 including land less than 1.0 mu, group2 land between 1.1-3.0 mu, group3 land between 3.1-5.0 mu, while group4 land area greater than 5.0 mu. Simularly, we create three groups for the explanatory variable number of persons in each household as follows: group1 including households with 2 persons, group2 includes households with 3 persons, and group3 includes households with 4 persons and more. We also categorized rural persons by their education level into three groups as follows: group1 including illiterate, literate, and primary education, group2 middle junior and senior education, while group3 primary and college education. Finally, the rural persons are distinguished into two groups according to their gender.

5.1 Choice of Employment

Table 1 presents the maximum likelihood analysis of variance results, which summarize the main effects of the GPL model, that was estimated using 4,232,913 observations. The likelihood ratio statistic indicates the goodness of fit of the model,

while the chi-square values indicate the significance of the explanatory variables. The likelihood ratio statistic for the model has a value of 60104 and 408 degrees of freedom, indicating a good fit.

The hypothesis to be tested is that employment and labor migration is affected by the gender of rural persons. The results presented in Table 1 reveal a strong relationship between gender and sector of work. The gender has Wald Chi-Square values of 96,986 with 2 degrees of freedom. We reject the hypothesis that gender has no influence on type of employment at less than 1% level of significance. Our results indicate that the level of education has a significant influence on the type of employment (Table 1). The Wald Chi-square values for the education level is 175,859 with 4 degrees of freedom. The age, size of households, and land size are also significant factors in determining the type of employment (Table 1) as the Wald Chi-square values are of 141,737 (with degrees of freedom of 4) and 26,905 (with degrees of freedom of 4, and 493,121 with degrees of freedom of 6).

Table 2 presents the parameter estimates for the models, along with the standard error values to indicate the statistical significance of the estimated parameters. The parameter estimates are arranged according to the logits they reference. The size of the estimated coefficients suggest that the land size variable has the largest effect on both logits, that is, the full-time non-agricultural and part-time agricultural & part-time non-agricultural employment with respect to full-time agricultural employment. This indicates that the land size is the most important variable explaining labor by type of employment. The land size is followed in significance by the level of education, and the age group (see Table 2) in the model for part-time agricultural & part-time non-agricultural vs. full-time agricultural employment. In the model for full-time non-agricultural vs. full-time agricultural employment, land size is followed in magnitude by age group and then education.

To facilitate the interpretation of the estimated parameters, we calculate *odds ratios*. We compare the odds of employment in non-agricultural activities, either part-time non-agricultural and part-time agricultural activities, vs. full-time agricultural employment by gender, different education levels, size of households, and land size. The odds ratio measures the likelihood of choosing on type of employment over any other choice. For example, to compare the odds of choosing part-time agricultural and part-time non-agricultural employment over full-time agricultural employment by females vs. males, we compute the odds ratio using equation 6 and the model parameters in Table 2 as:

$$\frac{e^{a_1 - b_1 + b_3 + b_7 + b_{11} + b_{17}}}{e^{a_1 + b_1 + b_3 + b_7 + b_{11} + b_{17}}} = \frac{0.864}{0.418} = 2.07$$

where the parameter for females is the inverse of the coefficients for males(-$\$_1$). That is, the odds ratio indicates that young (age-group1) females with low education level (education in group1), with small size of land are 2.0 times more likely to choose part-

time agricultural and part-time non-agricultural employment relative to male with similar education, age, and household size. The odds ratio regarding the choice between full-time non-agricultural vs. full-time agricultural employment is 1.2. In other words, females are 1.2 time more likely to be involved in full-time non-agricultural than full-time agricultural employment than males. This indicates that young females vs. males are more likely to be involved in part-time non-agricultural employment than full-time agricultural employment, given other factors remain the same.

Since the most significant variable is land size, we calculate the odds ratio for young males with low education (group1) in large household families (group3) and with land size between 3.1-5.0 mu. Individuals with these characteristics are 13 times more likely to choose full-time agricultural vs. part-time agricultural and non-agricultural employment than young males with the same household size but with less available land (1.1 and 3.0 mu).

$$\frac{e^{a_1+b_1+b_3+b_7-b_{11}-b_{13}+b_{17}}}{e^{a_1+b_1+b_3+b_7-b_{11}-b_{13}+b_{19}}} = \frac{2.035}{0.152} = 13.34$$

The odds ratio indicates the significance of land in choices of type of employment for young rural males. The odds ratio for full-time agricultural vs. full-time non-agricultural employment for young males with low education (group1) in the large household families (group3), and land size between 3.1-5.0 mu is 5.39. This indicates the significance of the full-time non-agricultural employment and its benefits, although the effect of the land holdings is still large for rural young males.

The same GPL model was estimated for each of the three economic regions to capture possible regional differences. The goodness-of-fit and estimated parameters are presented in tables 3-8. The estimated parameters (see Tables 3, 5, and 7) are highly significant indicated by the Wald Chi-Square values for each of the variables in each economic region. The estimated coefficients for each region are presented in Tables 4, 6, and 8. The results are similar to the national level specification but regional differences prevail. For example, the land size coefficient has the largest value for both full-time non-agricultural and part-time agricultural & part-time non-agricultural employment with respect to full-time agricultural employment. This indicates that land size is the most important variable explaining labor by type of employment, followed by the level of education, and age group in the model for part-time agricultural and part-time non-agricultural vs. full-time agricultural employment (see Table2). Regarding the model of full-time non-agricultural vs. full-time agricultural employment, land size is followed by the age group, and then the education level.

We calculate the odds ratio for the for young, males with low education (group1) in the large household family (group3) and land size between 3.1-5.0 mu for the three

regions. The odds ratio is 13.38, 6.91, and 14.08 for the East, Middle, and West Regions, respectively. The ratios indicate that young, males within a large household and land size between 3.1-5.0 mu prefer full time employment in agricultural activities vs. part-time agricultural and non-agricultural employment. However, the ratio for the Middle Region is almost half the size of the other regions' ratio indicating the willingness of young males in the Middle Region to get involved in part-time non-agricultural activities even though the larger land size. The same odds ratio with respect to full-time agricultural vs. full-time non-agricultural employment for young males with low education (group1) in large household family (group3), and land size between 3.1-5.0 mu vs. land size between 1.0-3.0 mu are 4.70, 7.16 and 2.59 for the East, Middle, and West Regions, respectively. This indicates the significance of the full-time non-agricultural employment and its benefits although the effect of the land holdings is still large for the rural young males. The effects of land holdings is diminishing in the West Region capturing the underlying low earnings in agricultural activities in this region.

5.2 Rural Labor Employment and Migration-Estimated Probabilities

While the odds ratio are useful to facilitate the interpretations of the model, the model also using the estimated parameters generates the maximum likelihood values of predicted probabilities of labor employment in each labor category at the national level (see table 9). The estimated probabilities indicate the type of employment for rural persons given certain demographic and economic characteristics, such as gender, age, education, size of households, and available land size. These estimated probabilities consequently capture the trends and potential for labor migration.

Table 9 presents the results of the predicted probabilities for both gender, for all age groups, all education levels, all size of household groups but for two land sizes to make the table more readable. We include only the smallest and largest land size, LS1 and LS4, respectively. For example, the probability for young males with elementary education, in the smallest household group, and land size to be engaged in full-time agricultural activities is 0.26 while in non-agricultural activities is 0.62. When the land size increases the probability for young males to be engaged in full-time agricultural activities is 0.91. For young, males, as the education level increases to middle and high school but the household size and land size are in the first groups, respectively, the probability for full-time agricultural employment decreases by half (.12). In this case, if the land size increases (LS4), the probability of full-time agricultural employment decreases by 14 percent. As the education level increases the probability of young males in the first group of household size and land size decreases to 0.02. The effects of education, household size and land size becomes smaller on full-time agricultural employment as age increases. The estimated probabilities for females follow similar pattern as that for males. However, the estimated probabilities for females engaged in full-time agricultural activities are larger than that for males indicating the probabilities for female to migrate are smaller than that of male. When it comes to non-agricultural activities, the probabilities for female are almost the same as that for male only when for

the college educational level. It is obvious that investment in human capital increase the trends for rural persons to be engaged in non-agricultural activities.

Increases in age for the same education level (elementary), household size (household group 1), and land size (land size 1) the probability for males to be engaged in full-time agricultural activities is almost .60 but for female is 0.76 (see table 9). The age level lowers the probabilities for labor migration with increase in education level for both male and female to 0.16 and 0.08, respectively. The effect of land size dominates and even dampens the effects of the education level, especially for females. For example, for young males and females with college education and land holdings is in the first group the probability for full-time employment in agricultural activities is 0.02 and 0.04, respectively. As land size increases (5.0 mu and more) the probability for full-time employment in agricultural activities increases to 0.40 and 0.44 for male and female respectively. The effect of household size on labor migration is also noticeable in affecting the size of the estimated probabilities. For example, as the land size and educational level increase, the effects of increases in household size reduce on the estimated probabilities from full-time agricultural employment from 12 to 50 percent.

In sum, the estimated probabilities indicate that land size holdings and education level play important role in labor migration, suggesting that institutional changes on land holdings and increase in educational opportunities can greatly increase migration of rural labor from agricultural to non-agricultural activities. This is more relevant to younger than older rural persons. At the mean time, the size of household increases the pressure for labor migration to non-agricultural activities.

6. Summary

This study examines the rural labor market in China, its characteristics, possible constrains, and potential for migration using the country' first national agricultural Census. The national Census provides us with unique opportunity to study the structure of rural labor in China on its entireness. The Census covers all Chinese persons and households in rural area, non-household agricultural production units, township enterprises, as well as administrative organizations of all villages and towns and collected numerous data about China's rural and agricultural economy.

We analyze the demographic characteristics of the rural labor force and the association between rural types of employment, place of work, and labor migration. We estimate demographic distributions of rural labor force and attempt to capture their relation with the distribution of other resources especially land availability or land constraints. In an attempt to capture the dynamic trends of rural labor force we apply and estimate a generalized polytomous logit (GPL) model to analyze the patterns of rural labor employment and gauge rural migration.

We categorize all rural persons between the age 15 to 60 for male and 15 to 55 for female into three groups: full-time engaged either in agricultural or non-agricultural

activities while the third group includes persons who work full-time but half of their time involved agricultural and half of their time involved non-agricultural activities.

The descriptive statistics highlight distinct differences of the three type of employment by age, educational level, size of the household, and size of land holdings. Formal analysis of the labor distribution by type of employment reveals underlying differences both at the national and regional levels. The estimation of a generalized polytomous logits results in obtaining the odds ratios and predicted probabilities of rural persons by types of the employment. The effects of land size followed by the education level and age group are the main factors affecting the estimated probabilities of rural employment and hence, the trends and dynamics of rural labor migration to non-agricultural activities even part-time or full-time base.

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Table 1. Maximum Likelihood Analysis of Model Fit and Significance of the Variables, National Level

Variable	Degree of freedom	Chi Square	Probability
Intercept	2	54709.79	<0.001
Gender	2	96986.64	<0.001
Age groups	4	141737.6	<0.001
Education groups	4	175859.6	<0.001
Size of household	4	26905.21	<0.001
Land size	6	493121.3	<0.001
Likelihood ratio	408	60104.29	<0.001

Table 2. Generalized Multinomial Logit (GPL) Model, National Level

Model 1	Logit (Part-time agr. & part-time non-agr. / Full-time agr.)			Logit (Full-time non-agr. / Full-time agr)		
Variable	Coefficient		Std. Error	Coefficient		Std. Error
Intercept	α_1	0.9606*	0.0056	α_2	-0.3615*	0.0058
Gender(male)	β_1	-0.3626*	0.0017	β_2	0.0850*	0.0021
Age Group1	β_3	-0.9369*	0.0027	β_4	-0.6533*	0.0033
Age Group2	β_5	0.1213*	0.0022	β_6	0.0968*	0.0027
Educ. Group1	β_7	1.3289*	0.0052	β_8	0.2258*	0.0052
Educ. Group2	β_9	0.3262*	0.0051	β_{10}	0.2469*	0.0050
Size of Household 1	β_{11}	0.5232*	0.0051	β_{12}	0.2098*	0.0059
Size of Household 2	β_{13}	-0.0372*	0.0036	β_{14}	0.0862*	0.0041
Land size1	β_{17}	-2.3846*	0.0038	β_{18}	-1.0917*	0.0044
Land size2	β_{19}	0.2065*	0.0025	β_{20}	0.5738*	0.0031
Land size3	β_{21}	0.8491*	0.0034	β_{22}	0.4263*	0.0043

* significant at 1% level; ** significant at 5% level.

Table 3. Maximum Likelihood Analysis of Model Fit and Significance of the VariablesEast Economic Region

Variable	Degree of freedom	Chi Square	Probability
Intercept	2	10923.62	<0.001
Gender	2	42244.50	<0.001
Age groups	4	68138.20	<0.001
Education groups	4	59399.19	<0.001
Size of household	4	15465.12	<0.001
Land size	6	271747.10	<0.001
Likelihood ratio	406	30200.03	<0.001

Table 4. Generalized Multinomial Logit (GPL) Model, East Economic Region

Model 1	Logit (Part-time agr. & part-time non-agr. /Full-time agr.)			Logit (Full-time non-agr./Full-time agr)		
Variable	Coefficient		Std. Error	Coefficient		Std. Error
Intercept	α_1	0.7219*	0.0088	α_2	-0.1753*	0.0082
Gender(male)	β_1	-0.3504*	0.0025	β_2	0.0642*	0.0028
Age Group1	β_3	-1.0155*	0.0043	β_4	-0.6808*	0.0048
Age Group2	β_5	0.1488*	0.0034	β_6	0.1202*	0.0037
Educ. Group1	β_7	1.2471*	0.0083	β_8	0.3160*	0.0073
Educ. Group2	β_9	0.3190*	0.0082	β_{10}	0.2304*	0.0070
Size of Household 1	β_{11}	0.5803*	0.0074	β_{12}	0.2134*	0.0081
Size of Household 2	β_{13}	-0.0742*	0.0051	β_{14}	0.1389*	0.0056
Land size1	β_{17}	-2.4493*	0.0053	β_{18}	-1.3098*	0.0057
Land size2	β_{19}	0.1435*	0.0038	β_{20}	0.6225*	0.0044
Land size3	β_{21}	0.9494*	0.0053	β_{22}	0.5239*	0.0063

* significant at 1% level; ** significant at 5% level.

Table 5. Maximum Likelihood Analysis of Model Fit and Significance of the Variables Middle Economic Region

Variable	Degree of freedom	Chi Square	Probability
Intercept	2	24775.46	<0.001
Gender	2	35958.88	<0.001
Age groups	4	65151.00	<0.001
Education groups	4	37993.62	<0.001
Size of household	4	9816.61	<0.001
Land size	6	130034.20	<0.001
Likelihood ratio	404	20645.43	<0.001

Table 6. Generalized Multinomial Logit (GPL) Model, Middle Economic Region

Model 1	Logit (Part-time agr. & part-time non-agr. /Full-time agr.)			Logit (Full-time non-agr./Full-time agr.)		
Variable	Coefficient		Std. Error	Coefficient		Std. Error
Intercept	α_1	1.0747*	0.0097	α_2	-0.4677*	0.0106
Gender(male)	β_1	-0.3782*	0.0032	β_2	0.1704*	0.0041
Age Group1	β_3	-1.1188*	0.0047	β_4	-0.5987*	0.0060
Age Group2	β_5	0.1297*	0.0041	β_6	0.0920*	0.0051
Educ. Group1	β_7	1.2030*	0.0089	β_8	0.1150*	0.0094
Educ. Group2	β_9	0.4334*	0.0087	β_{10}	0.2432*	0.0090
Size of Household 1	β_{11}	0.4760*	0.0100	β_{12}	0.1957*	0.0120
Size of Household 2	β_{13}	0.0358*	0.0070	β_{14}	-0.0205*	0.0084
Land size1	β_{17}	-2.3887*	0.0077	β_{18}	-0.9613*	0.0091
Land size2	β_{19}	0.2559*	0.0046	β_{20}	0.5863*	0.0057
Land size3	β_{21}	0.8396*	0.0059	β_{22}	0.4196*	0.0075

* significant at 1% level; ** significant at 5% level.

Table 7. Maximum Likelihood Analysis of Model Fit and Significance of the Variables West Economic Region

Variable	Degree of freedom	Chi Square	Probability
Intercept	2	21394.28	<0.001
Gender	2	25429.01	<0.001
Age groups	4	23752.00	<0.001
Education groups	4	51125.90	<0.001
Size of household	4	3003.22	<0.001
Land size	6	50951.35	<0.001
Likelihood ratio	406	15117.06	<0.001

Table 8. Generalized Multinomial Logit (GPL) Model, West Economic Region

Model 1	Logit (Part-time agr. & part-time non-agr. /Full-time agr.)			Logit (Full-time non-agr./Full-time agr)		
Variable	Coefficient		Std. Error	Coefficient		Std. Error
Intercept	α_1	1.1885*	0.0114	α_2	-0.7073*	0.0138
Gender(male)	β_1	-0.4208*	0.0036	β_2	0.1347*	0.0054
Age Group1	β_3	-0.7313*	0.0052	β_4	-0.5746*	0.0081
Age Group2	β_5	0.0094*	0.0046	β_6	0.1113*	0.0066
Educ. Group1	β_7	1.4803*	0.0105	β_8	0.2256*	0.0124
Educ. Group2	β_9	0.2871*	0.0105	β_{10}	0.2135*	0.0122
Size of Household 1	β_{11}	0.3683*	0.0103	β_{12}	0.2234*	0.0136
Size of Household 2	β_{13}	-0.0284*	0.0072	β_{14}	0.0545*	0.0095
Land size1	β_{17}	-1.8080*	0.0086	β_{18}	-0.6878*	0.0121
Land size2	β_{19}	0.1622*	0.0052	β_{20}	0.2637*	0.0074
Land size3	β_{21}	0.5552*	0.0070	β_{22}	0.1183*	0.0104

* significant at 1% level; ** significant at 5% level.

Table 9-- Predicted Probabilities of Labor Employment by Categories, National Level									
					Part-time agriculture &		Full-time		
				Full-time agriculture	part-time non-agriculture		Non-agriculture		
Gender	Age	Education	Size of Houshold	Land Size					
			Number of persons	LS1	LS4	LS1	LS4	LS1	LS4
Male	Group1	Elementary	1-2	0.26	0.91	0.12	0.04	0.62	0.05
			3	0.17	0.86	0.13	0.05	0.70	0.09
			4 and more	0.12	0.82	0.10	0.05	0.78	0.13
		Middle+High	1-2	0.12	0.78	0.15	0.09	0.73	0.13
			3	0.07	0.69	0.14	0.12	0.79	0.19
			4 and more	0.04	0.62	0.11	0.11	0.85	0.27
		College	1-2	0.02	0.40	0.09	0.15	0.89	0.45
			3	0.01	0.28	0.08	0.16	0.91	0.56
			4 and more	0.01	0.21	0.06	0.13	0.94	0.66
	Group2	Elementary	1-2	0.46	0.95	0.16	0.03	0.38	0.02
			3	0.34	0.93	0.18	0.04	0.48	0.03
			4 and more	0.26	0.91	0.15	0.04	0.59	0.05
		Middle+High	1-2	0.23	0.88	0.24	0.07	0.53	0.05
			3	0.15	0.82	0.24	0.10	0.61	0.08
			4 and more	0.11	0.78	0.19	0.10	0.70	0.12
		College	1-2	0.05	0.60	0.17	0.16	0.78	0.24
			3	0.03	0.47	0.15	0.21	0.82	0.32
			4 and more	0.02	0.39	0.12	0.18	0.87	0.43
	Group3	Elementary	1-2	0.59	0.97	0.17	0.02	0.24	0.01
			3	0.46	0.95	0.20	0.03	0.34	0.02
			4 and more	0.38	0.94	0.18	0.03	0.44	0.03
		Middle+High	1-2	0.34	0.91	0.27	0.06	0.39	0.03
			3	0.23	0.87	0.30	0.09	0.47	0.04
			4 and more	0.19	0.85	0.24	0.09	0.57	0.06
		College	1-2	0.08	0.71	0.24	0.16	0.68	0.14
			3	0.05	0.60	0.22	0.20	0.73	0.21
			4 and more	0.04	0.52	0.16	0.19	0.80	0.29
Female	Group1	Elementary	1-2	0.42	0.96	0.09	0.01	0.49	0.03
			3	0.31	0.93	0.08	0.03	0.61	0.04
			4 and more	0.22	0.91	0.08	0.02	0.70	0.07
		Middle+High	1-2	0.21	0.89	0.12	0.04	0.67	0.07
			3	0.13	0.83	0.04	0.06	0.83	0.11
			4 and more	0.09	0.77	0.09	0.07	0.82	0.16
		College	1-2	0.04	0.44	0.08	0.16	0.88	0.40
			3	0.02	0.45	0.07	0.11	0.91	0.44
			4 and more	0.02	0.36	0.04	0.09	0.94	0.55
	Group2	Elementary	1-2	0.65	0.98	0.09	0.01	0.26	0.01
			3	0.52	0.97	0.12	0.01	0.36	0.02
			4 and more	0.43	0.96	0.10	0.01	0.47	0.03

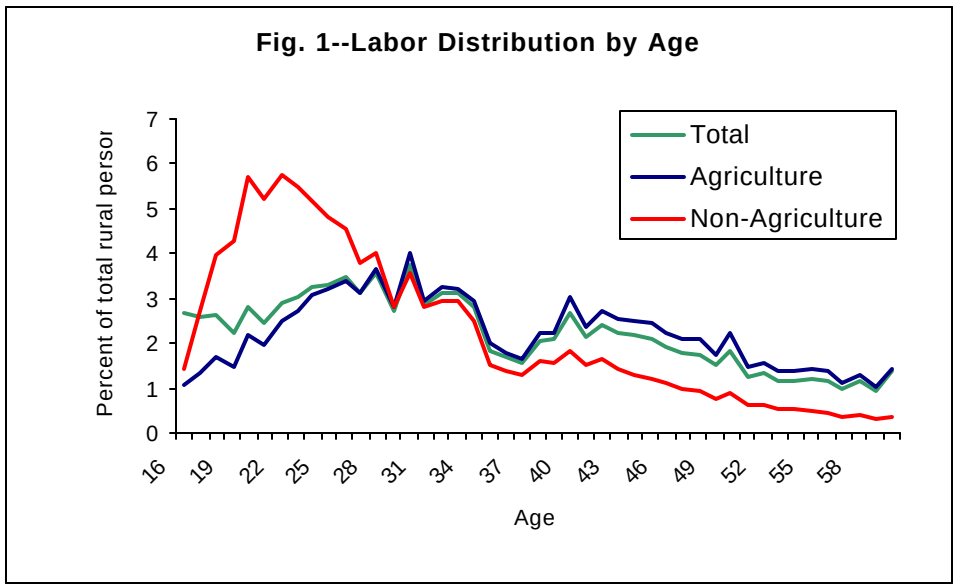


Fig. 1--Labor Distribution by Age
Percent of total rural persor
7
6
5
4
3
2
1
0
16
19
22
25
28
31
34
37
40
43
46
49
52
55
58
Age
Total
Agriculture
Non-Agriculture

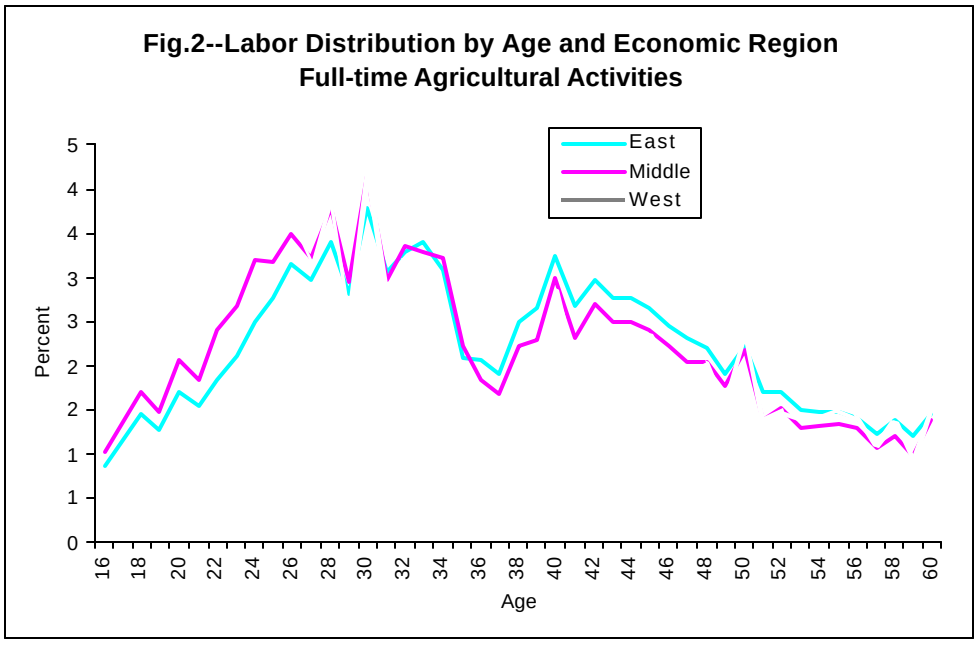


Fig.2--Labor Distribution by Age and Economic Region
Full-time Agricultural Activities
East
Middle
West
Percent
0
1
1
2
2
3
3
4
4
5
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
Age

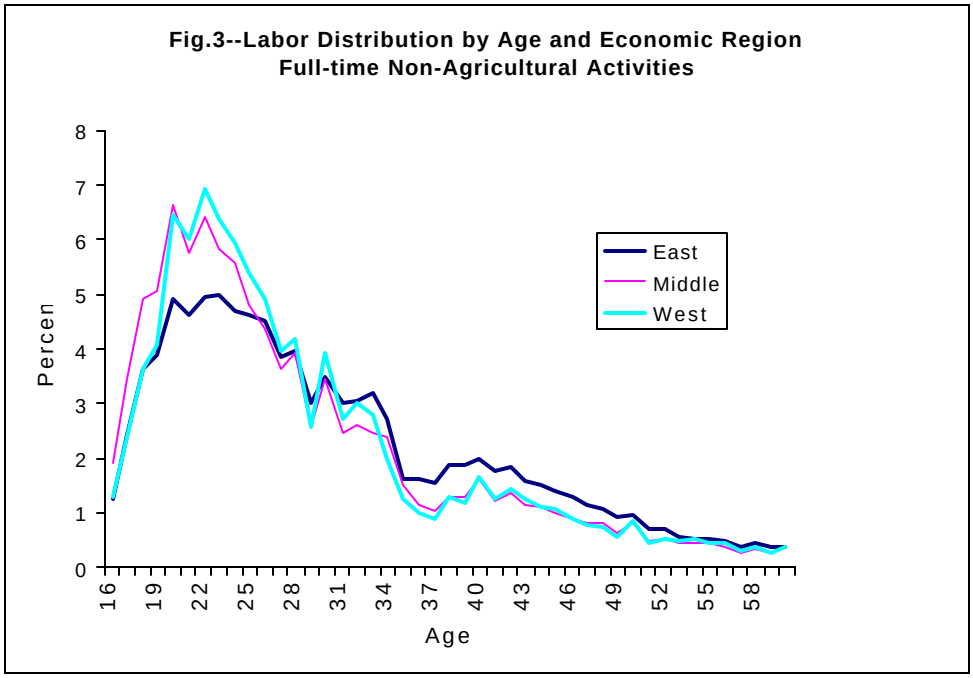
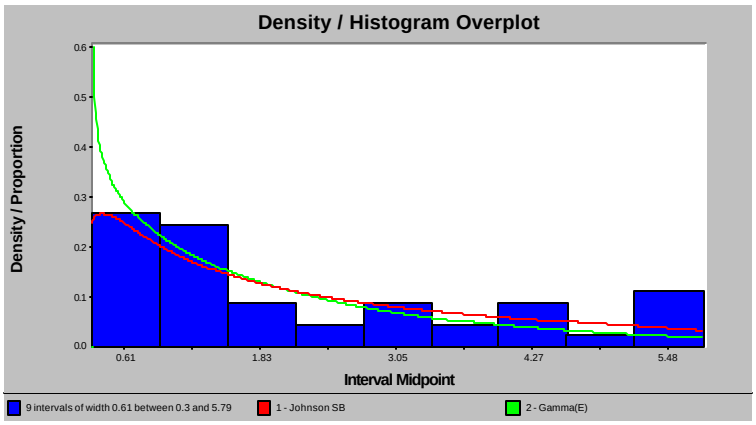


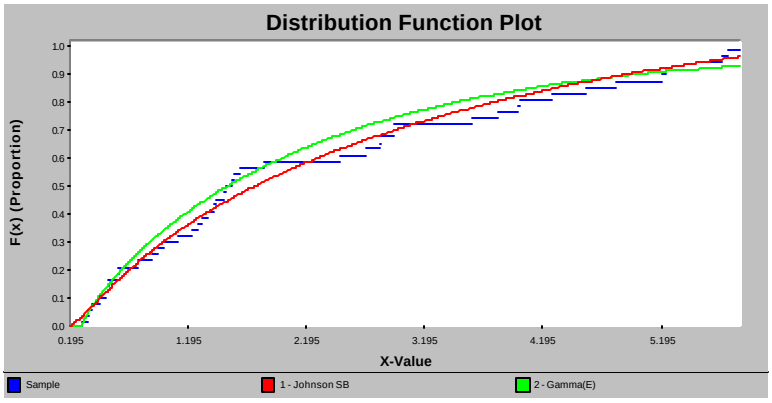
Fig.3--Labor Distribution by Age and Economic Region
Full-time Non-Agricultural Activities
East
Middle
West
Percen
0
1
2
3
4
5
6
7
8
16
19
22
25
28
31
34
37
40
43
46
49
52
55
58
Age

Fig.4--Distribution of Rural Labor Force by Age in Full-time Agricultural Activities, National Level

Model	Score*
1 - Johnson SB	92.86
2 - Gamma(E)	89.29
3 - Weibull(E)	85.71

* the larger the score the better the fit; 100 is the maximum





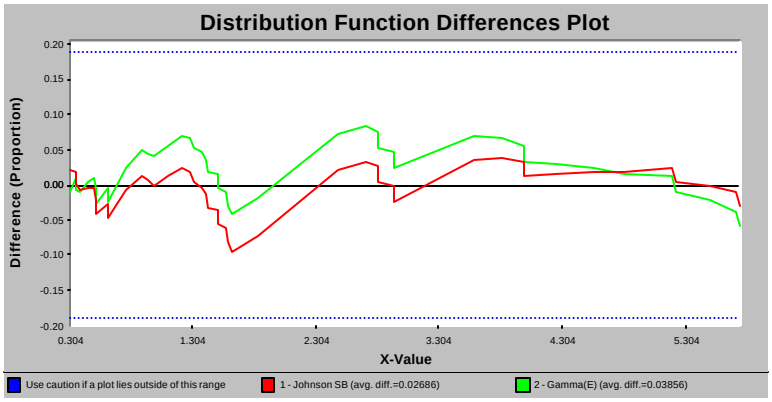
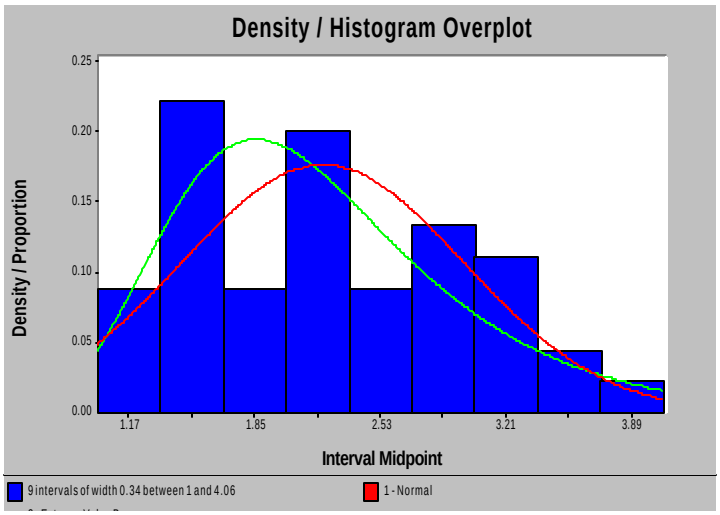
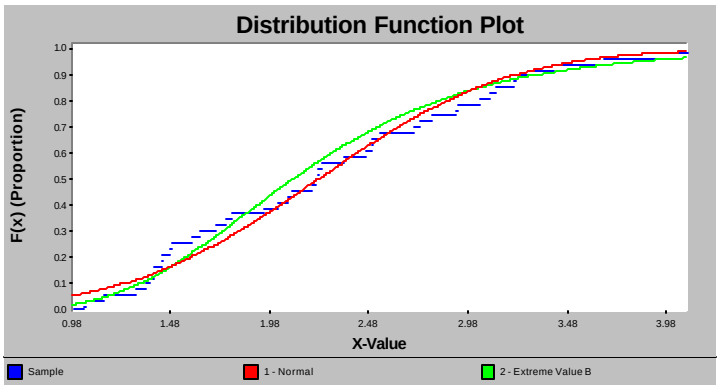


Fig.5--Distribution of Rural Labor Force by Age in Full-time Non-Agricultural Activities , National Level

Model	Score*
1 - Normal	96.15
2 - Extreme Value B	90.38
3 - Logistic	84.62

* the larger the score the better the fit; 100 is the maximum





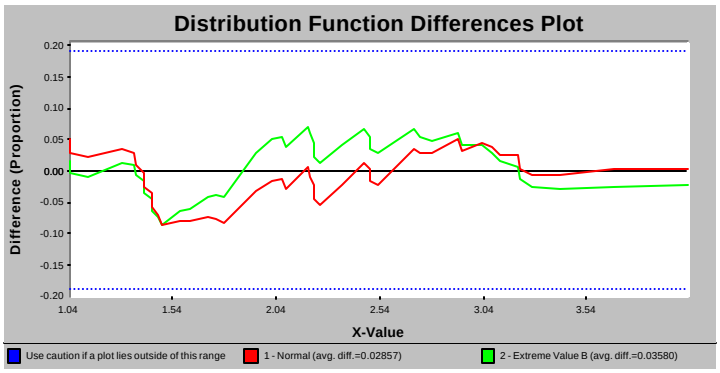
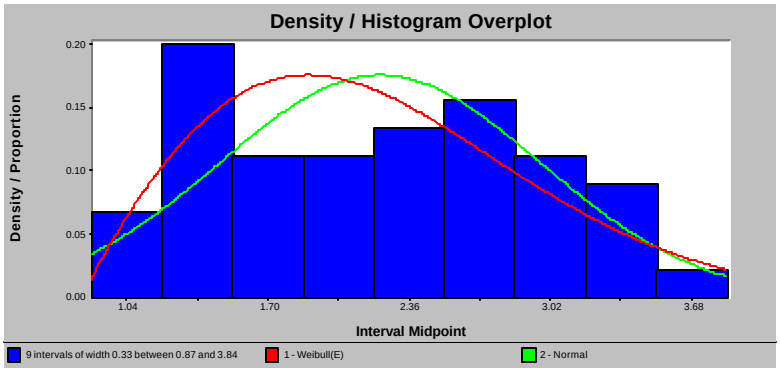
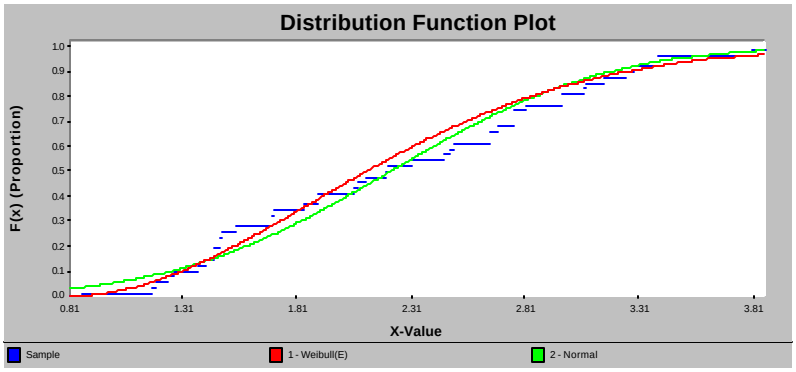


Fig.6--Distribution of Rural Labor Force by Age in Full-time Agricultural Activities, East Region

Model	Score*
1 - Weibull(E)	93.33
2 - Normal	90.00
3 - Rayleigh(E)	85.00

* the larger the score the better the fit; 100 is the maximum





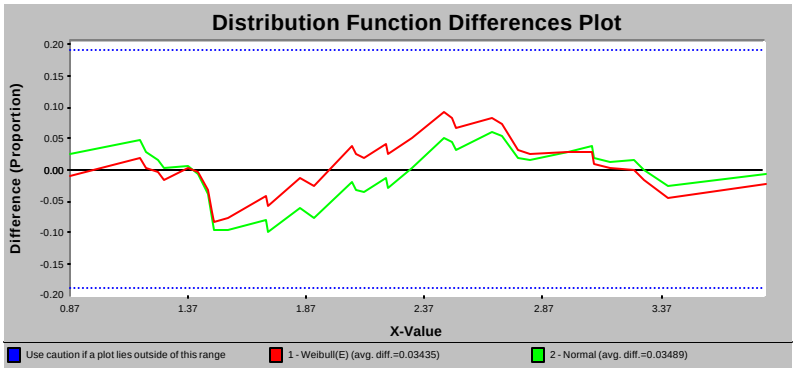
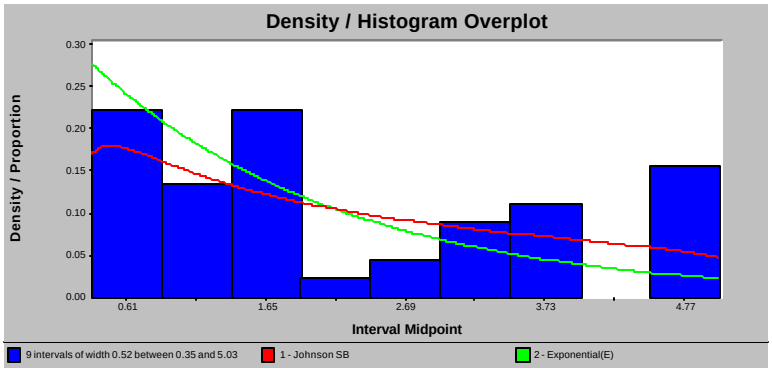
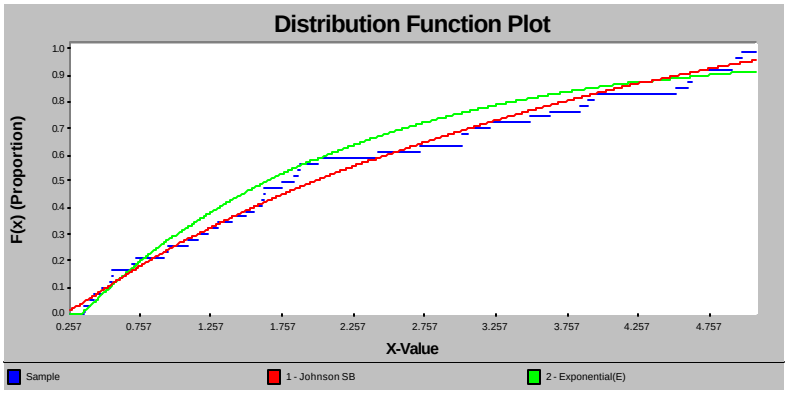


Fig.7--Distribution of Rural Labor Force by Age in Full-time Non- Agricultural Activities, East Region

Model	Score*
1 – Johnson SB	100.00
2 – Exponential(E)	82.14
3 – Weibull(E)	82.14

- the larger the score the better the fit; 100 is the maximum





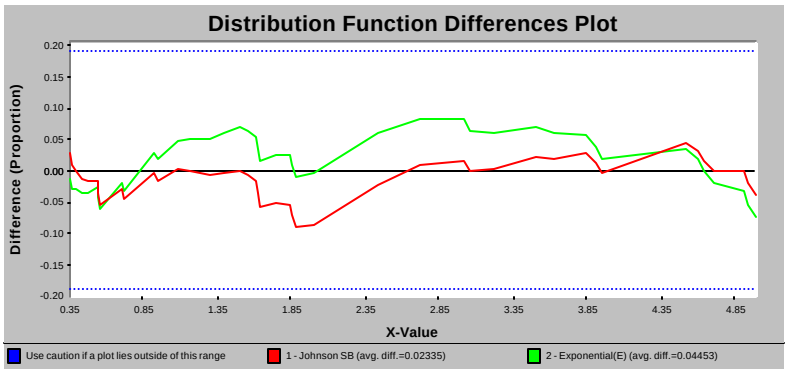
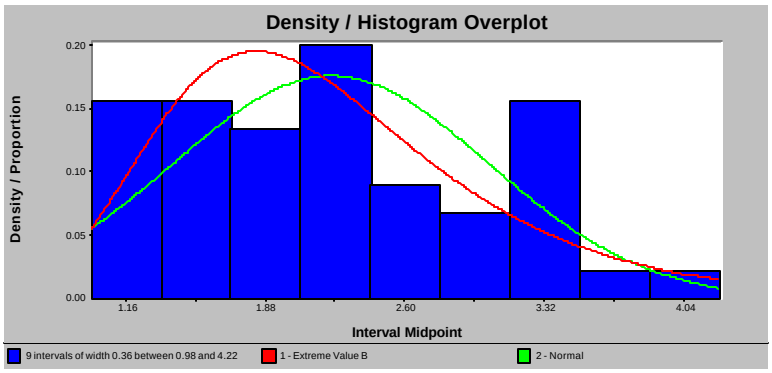
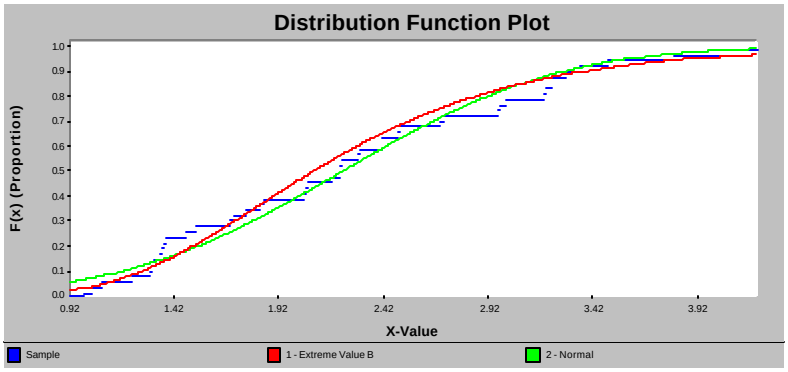


Fig.8--Distribution of Rural Labor Force by Age in Full-time Agricultural Activities, Middle Region

Model	Score*
1 – Extreme Value B	92.86
2 – Normal	89.29
3 – Logistic	85.71

- the larger the score the better the fit; 100 is the maximum





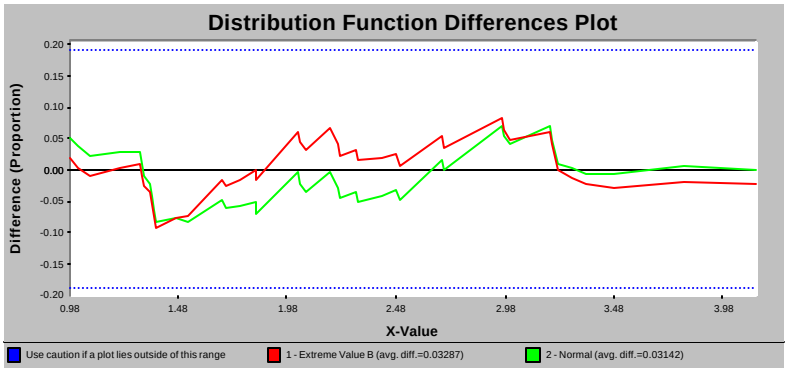
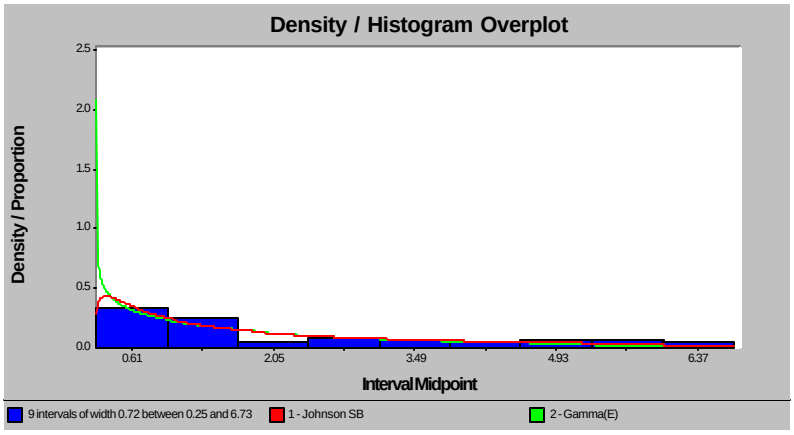
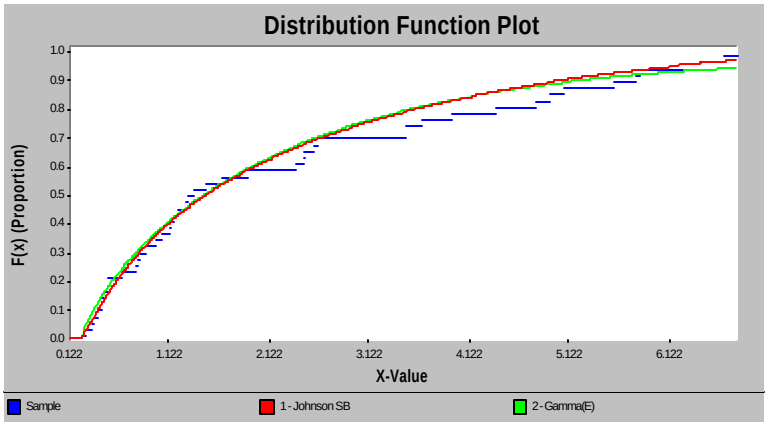


Fig.9--Distribution of Rural Labor Force by Age in Full-time Non- Agricultural Activities, Middle Region

Model	Score*
1 - Johnson SB	100.00
2 - Gamma(E)	91.07
3 - Weibull(E)	87.50

- the larger the score the better the fit; 100 is the maximum





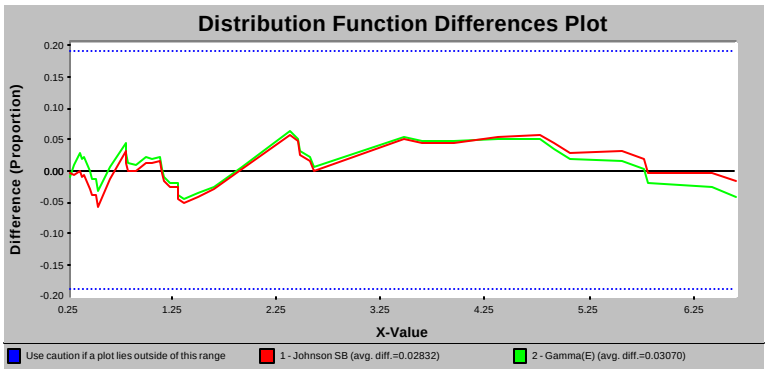
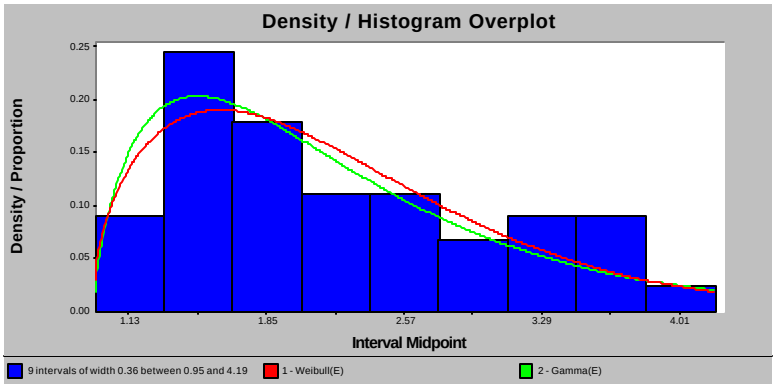
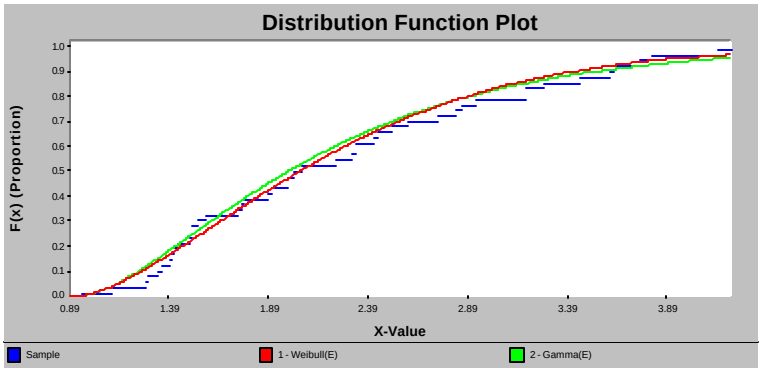


Fig.10--Distribution of Rural Labor Force by Age in Full-time Agricultural Activities, West Region

Model	Score*
1 - Weibull(E)	100.00
2 - Gamma(E)	90.00
3 - Erlang(E)	88.33

* the larger the score the better the fit; 100 is the maximum





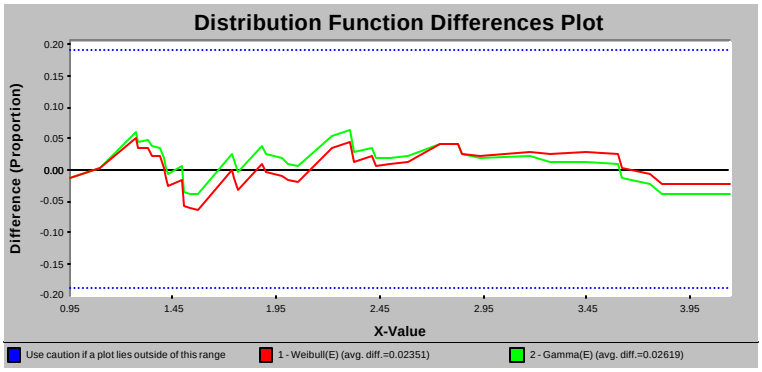
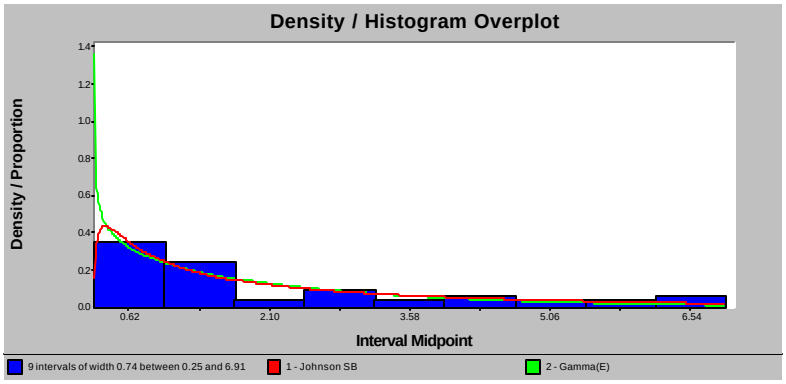
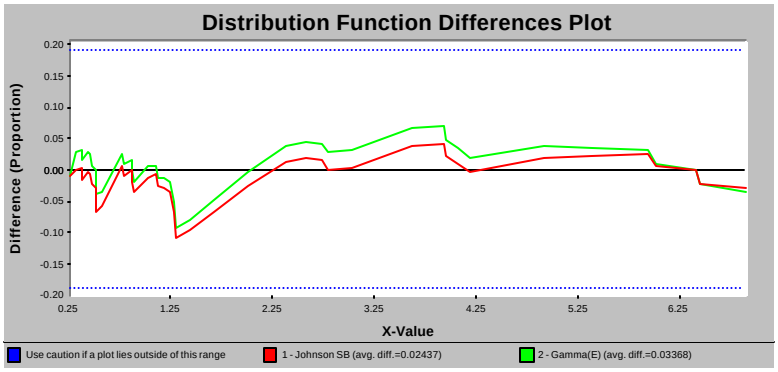


Fig.11--Distribution of Rural Labor Force by Age in Full-time Non-Agricultural Activities, West Region

Model	Score*
1 - Johnson SB	94.64
2 - Gamma(E)	91.07
3 - Weibull(E)	91.07

* the larger the score the better the fit; 100 is the maximum





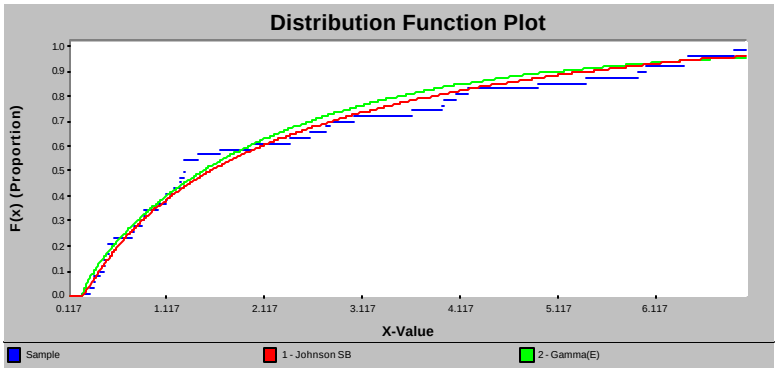


Fig.12--Distribution of Rural Labor Force by Education Level

Under different age groups

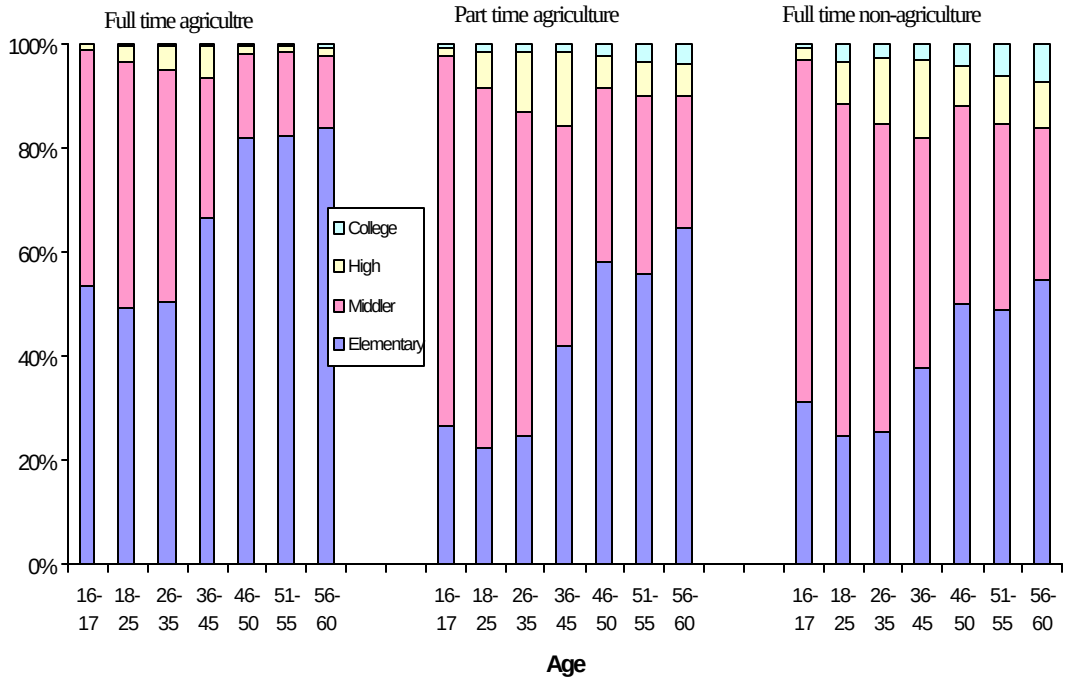


Fig.13--Distribution of Rural Labor Force by Gender

Under age groups

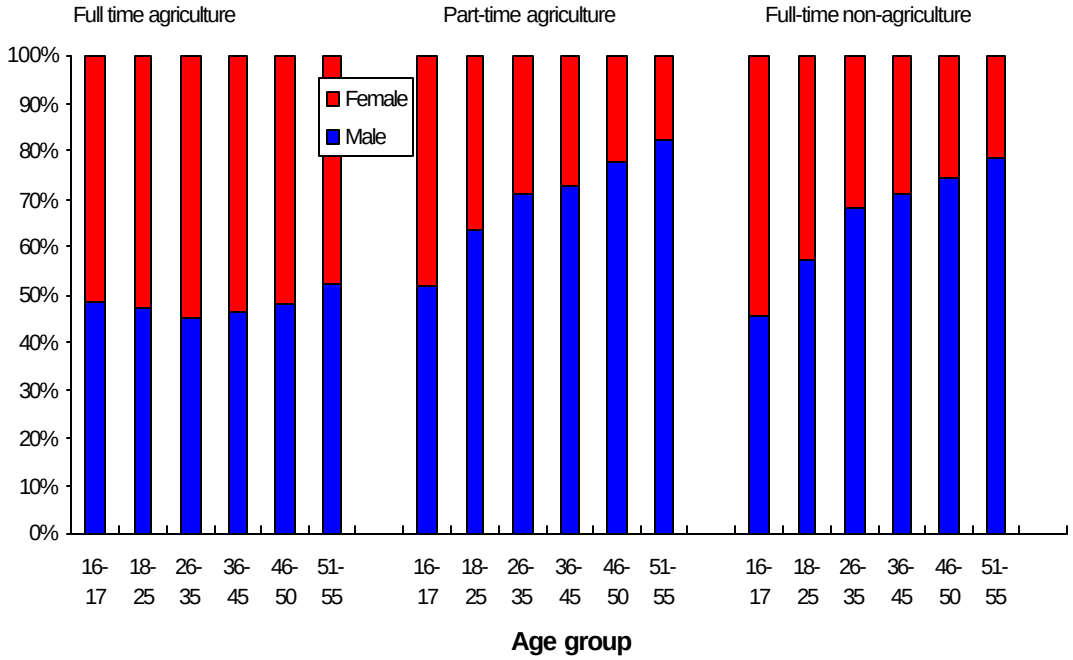


Fig.14–Distribution of Rural Labor Force by Gender.

Under different education groups

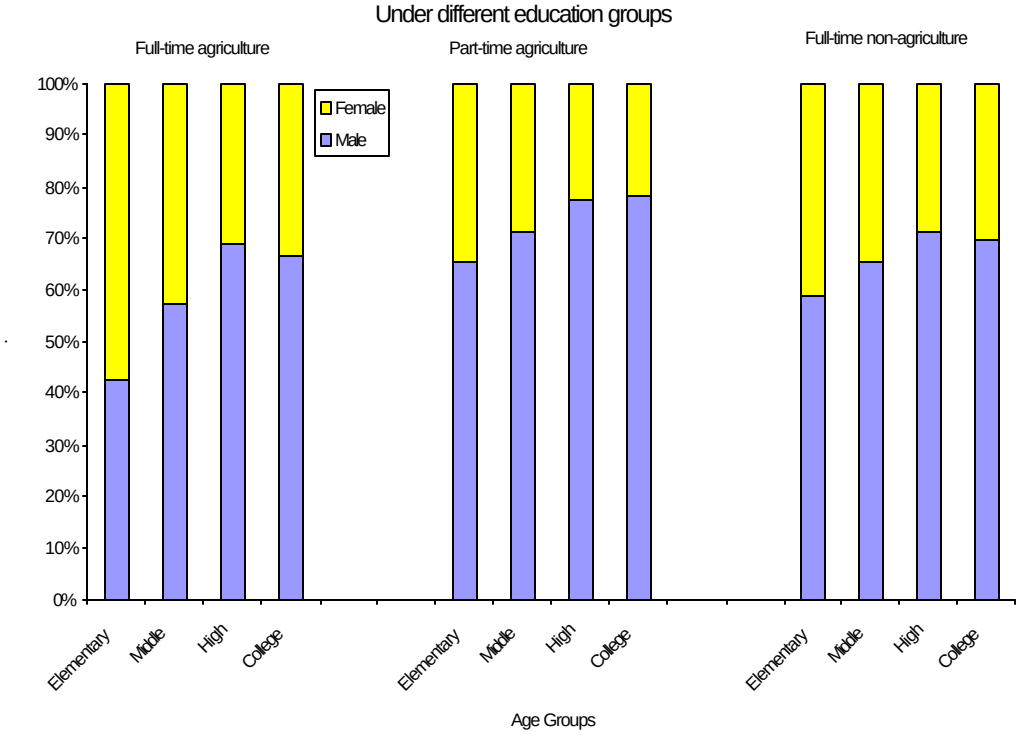
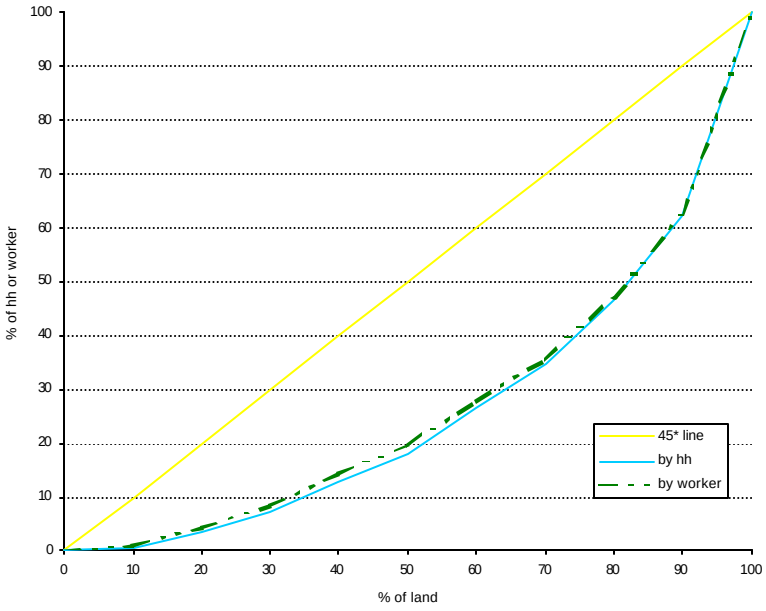


Fig.15--Land holding distribution cross households



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