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## The effects of China's Grain for Green program on migration and remittance

Claudio O. Delang<sup>a</sup>

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**ABSTRACT:** The Grain for Green (GfG) is the largest reforestation program of the world. It involved payments to farmers to convert their marginal farmland. Many farmers decided to migrate. This paper looks at some of the household features associated with migration by GfG-participants, and the importance of remittances to those who remained behind. Fieldwork for this research was carried out in Pengshui County in Chongqing Municipality. Several variables affect migration, including education, land ownership and household size. For most households, remittances consist of over 90 percent of all household incomes, but the amount remitted tends to level off when it reaches a certain size, regardless of the number of household members who migrated.

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**KEYWORDS:** Grain for Green program, China, migration, remittances.

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### Los efectos del programa “Grain for Green” de China en migración y remesas

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**RESUMEN:** El Grain for Green (GfG) es el programa de reforestación más grande del mundo. Implicaba pagos a los agricultores para transformar sus tierras marginales en la vegetación original (generalmente forestal). Muchos agricultores decidieron emigrar. Este documento analiza algunas de las características del hogar asociadas con la migración por parte de los participantes de GfG, y la importancia de las remesas para quienes se quedaron atrás. El trabajo de campo para esta investigación se llevó a cabo en el distrito de Pengshui en el municipio de Chongqing. Varias variables afectan la migración, incluidas la educación, la propiedad de la tierra y el tamaño del hogar. Las remesas forman más del 90 por ciento de todos los ingresos familiares, pero la cantidad total remitida tiende a estabilizarse cuando alcanza un cierto tamaño, independientemente de la cantidad de miembros del hogar que emigraron.

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**PALABRAS CLAVE:** Programa “Grain for Green”, China, emigración, remesas.

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**Clasificación JEL/ JEL Classification:** J61, Q12, R23.

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## 1. Introduction

In 1997, the Yellow River experienced a particularly severe drought with the lower reaches drying up for 267 days, jeopardising industrial, agricultural, and residential water uses in the northern plains (Xu and Cao, 2002). On the other hand, in 1998, massive floods along the Yangtze River claimed the lives of over 3,000 people, displaced some 18 million people and caused more than RMB 166 billion of damages (Lu *et al.*, 2002). Many environmental experts blamed these floods on soil erosion and deforestation in the upper reaches of the Yangtze and Yellow River watersheds (World Bank, 2001; Delang, 2017), even though some (e.g., Ferreira and Ghimire, 2012; Tan-Soo *et al.*, 2014) disagree on the extent to which deforestation contribute to floods.

As the devastating drought of 1997 and flood of 1998 brought deforestation to the forefront of public debate, the government responded through six environmental conservation and reforestation programs, to conserve the remaining forests and reforest the watersheds (Delang and Wang, 2013; Delang, 2016). The largest of these programs was the Grain for Green (GfG). The GfG is the largest reforestation program in the world, involving 124 million people, 32 million households in 1,897 counties (in 25 provinces, and the Xinjiang Production and Construction Corps) (Mao *et al.*, 2013). Between 1999 and 2008, China reforested a total of 26.87 million ha through the GfG, of which 9.27 million ha was former farmland and 15.8 million ha was barren hills and wasteland suitable for forests (Wu *et al.*, 2009). Wu *et al.* (2009) reported that the plan was to convert 14.66 million ha of cropland to forest, and cover 17.33 million ha of barren land with trees during the period from 2001 to 2010. The plan was to raise the forest and grass cover of the program's target area by 5 %, bring under control 86.66 million ha of soil and water-eroded area, and establish 103 million ha of sand-fixation areas (Delang and Yuan, 2014).

Through the GfG, farmers are paid to convert their sloped or degraded farmland to the original vegetation, either trees or grass. Trees could be either economic trees, which may generate incomes from the sale of fruits, or ecological trees, from which incomes can only be obtained through pruning. Payments were to last for three years for grassland, five years for economic trees, and eight years for ecological trees. Farmers were paid RMB 105 a year per mu (15 mu = 1 ha) in the Yangtze River watershed, and RMB 70 a year per mu in the Yellow River watershed. In 2007, the payment was extended for another period, due to fears that the farmers would outroot the plants if payments ended.

The GfG had both ecological and economic objectives. Among the ecological objectives were a reduction of landslides, siltation, flooding and droughts. Among the economic objectives were farmers' poverty alleviation: because most of the land targeted for reforestation was slope land (with slopes above 25°) or unproductive marginal land, most participants were poor. The GfG subsidies directly raised the incomes of some of these farmers. In addition, since farmers were compensated for no longer farming the land, they were able to engage in other on-farm or off-farm activities with greater financial returns. Many decided to migrate to urban areas.

This paper explores the impact of migration and remittances among rural households involved in land conversion through the GfG in one county. The analysis examines households' characteristics in a rural area in Chongqing Municipality, which was largely depopulated by migration. In the following sections, the extent of migration and its relation with the GfG is described firstly. Then the article explores i) the characteristics of the households that send migrants, in terms of education, amount of farmland, and household size; and ii) the amount remitted by migrants, and the relationship between the amount remitted and education and household size. This study aims at contributing to the existing literature on the transformations that the GfG has had on the villages from which migrants come from.

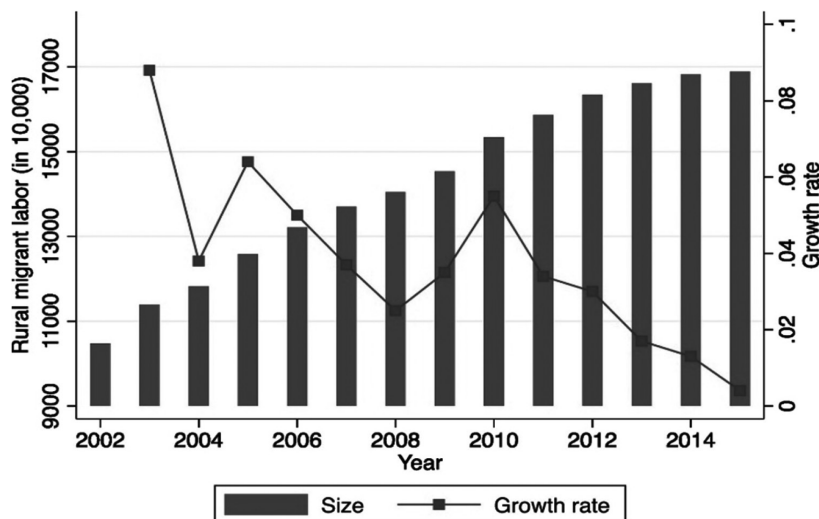
## 2. Grain for Green as a factor of rural migration

Two factors in particular encouraged the migration of farmers in the early 2000s. First, farmers who converted some of their land with the GfG were paid a government-guaranteed income roughly in line with farming incomes for setting aside the land. That income removed the financial constraints that may prevent the poorest farmers to migrate and take advantage of off-farm opportunities. Second, China experienced strong, protracted economic growth of about 10 % a year throughout the 1990s and 2000s, which generated a great deal of job opportunities for migrant labour.

The combination of GfG subsidies which facilitated the migration of the farmers and strong economic growth offering seemingly unlimited employment opportunities led to massive migration to urban areas (Figure 1) and the gradual depopulation of the countryside (Yan *et al.*, 2014). Many rural villages have now very few people in the age bracket 19-60. It is important to note that rural migration did not start with the GfG. Migration to cities had already begun and would have continued regardless of the GfG. Indeed, Liang *et al.* (2012) suggested that the increase in off-farm work may simply reflect the long-term trend toward greater reliance on off-farm work by farm households, or risk-coping strategies, rather than being a result of the GfG reforms. However, the GfG is likely to have accelerated processes that were already under way. Indeed, the role of the GfG in the acceleration of this process has been described by some researchers. For example, Peng *et al.* (2007) looked at the situation in Zhangye, a prefectural-level administrative area in Gansu Province, and found that the reduction in cropland caused by GfG-conversion resulted in a sharp increase in surplus labour. Most of the surplus labour force either migrated to other regions to work or engaged in non-agricultural work locally. Similarly, drawing on household data and descriptive statistics, Zhi (2004) shows that implementing the GfG has promoted the transfer of rural labor out of the farming sector. Hori and Kojima (2008) also found that, after the launch of the GfG program in Yulin district (Shaanxi province), the number of migrant workers among GfG program participants increased considerably.

At the same time, assessing the direct impact of the GfG is difficult, because the program is likely to have had an impact also among those who have not converted the land. If one individual migrated after converting land, his/her friends would also have been more likely to migrate, since they could benefit from their friend's expanded social network.

FIGURE 1  
Size of rural migrant labour 2002–2015 and its growth rate



Source: Su *et al.* (2018).

### 3. Migration and remittances

The benefits of migration to the rural areas are multiform. On the one hand, migration reduces the number of mouth that need to be fed with shrinking farmland. This is important in China, as the GfG was introduced in areas with mostly slope land, where rather unfertile soil was keeping farmers in relative poverty. On the other hand, migrant family members are likely to send remittances to their relatives, which is likely to make a considerable contribution to the total income of the rural households. Depending on the conditions of the household and the age structure of its members, in some cases remittances may be used to support relatives, especially children and seniors, while in other cases they may be used by the remaining family members to invest in increasing agricultural output. VanWey (2003) found that households with smaller landholdings use migration and remittances to supplement rural income, while households with larger landholdings use them to overcome the absence of credit in the village.

There is evidence that remittances are an important source of income for rural households in China, leading to decreasing poverty rates (Rozelle *et al.*, 1999; Taylor *et al.*, 2003; Zhu and Luo, 2010). However, there are contradictory findings as to the effect of remittances on household income and inequality. For example, Hua (2014) found that most of those who migrated from the rural areas tended to be better off,

with the result that remittances increased rural inequality in north-western China. On the other hand, Zhu and Luo (2010) found the opposite in rural Hubei province, due to greater participation in migration by poorer households. Similar results have been found outside China. For example, Stark *et al.* (1986), Adams (1989), Barham and Boucher (1998) Adams *et al.* (2008) found that migrants' remittances may increase income inequality in the receiving region, because relatively richer households tend to be the ones receiving remittances. On the other hand, Koechlin and Leon (2007) and Bang *et al.* (2016) found that remittances lead to larger income gains for poorer households compared to richer ones, thereby reducing rural income inequality. Taylor and Wyatt (1996) also found that remittances reduce inequality, as they "stimulate household farm incomes by relieving credit and risk constraints on household farm production" (p. 899). On the other hand, Taylor *et al.* (1996) and Durand *et al.* (1996) found more all-encompassing benefits of migration and remittances, since the poverty-reducing benefits of remittances to household incomes may have multiplier effects that also benefit households not receiving remittances.

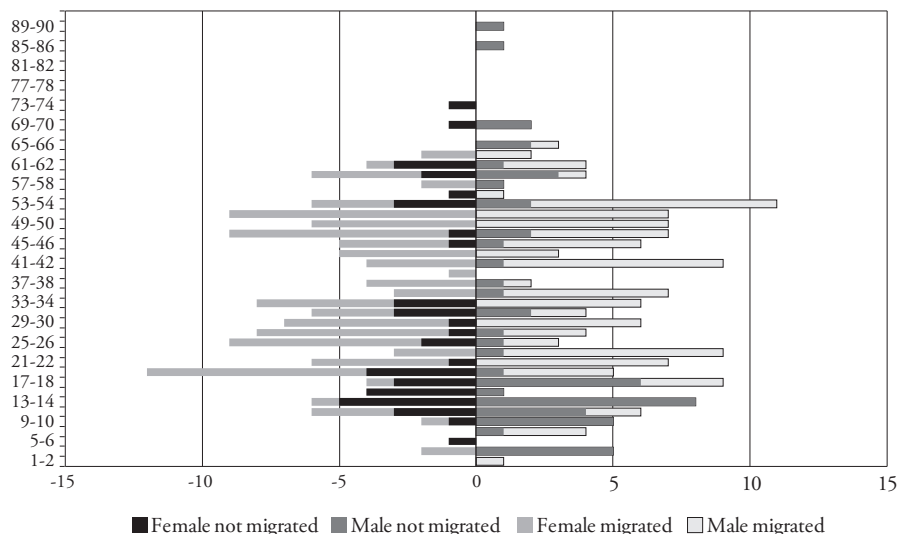
Finally, remittances have broader consequences, beyond their effect on inequality. As Gray (2009) pointed out, "qualitative studies indicate a large range of potential impacts of out-migration and remittances on agriculture, including abandonment of labor-intensive practices (Zimmerer, 1993), intensification of commercial agriculture (De Haas, 2006)", the monetization of previously subsistence-focused rural economies (Hull, 2007), a decline in reciprocal labour arrangements and an increase in the wage rate for such work (Chami *et al.*, 2018), a decline in common property management, and an increase in the commoditization of land (Cole *et al.*, 2015).

#### 4. Household survey and sample characteristics

A farm household survey was conducted in Pengshui county in Chongqing Municipality in June and July 2016. Chongqing Municipality is a provincial-level administrative unit in the centre of China. The author, together with two specially trained research assistants administered a questionnaire translated in Chinese to a senior person in the household. This questionnaire included demographic, economic, social and agricultural-related questions. A total of 81 households, covering 315 people, completed the questionnaire. Households here include all members of the family who migrated. It is possible that all members of some households migrated, and those are not included in the dataset obtained.

The average size of the household is of 3.89 individuals, with 52 % male, average age 35, and 54 children (17 %) in school. All land was converted by the GfG between 2002 and 2004. All land was converted to ecological forests, which means that no incomes could be obtained from the sale of tree products. The average size of the land converted was 1.25 mu per household (with the area varying from 0.68 and 9.5 mu). This is less than most other areas in China. The average amount of farmland still available for each household is 3.43 mu (with the area varying from 1.2 and 6.8 mu per household). This amount includes the more productive paddy rice land, and the less productive slopeland on which corn and vegetables are grown.

FIGURE 2

**Population pyramid: Migration, age and gender in the fieldwork area**

Source: Survey's results and author's calculations.

## 5. Findings and discussion

### 5.1. Migration, age and gender

Figure 2 shows the population pyramid of the 315 individuals included in the farm household survey, differentiating by migratory status. Figure 2 shows that most children remain in the localities, as do most old people. Until the age of 18, out of 39 young men, 30 (77 %) remain in the locality. Among young women the percentage is almost as high: out of 25 young women, 17 (68 %) remain in the locality. From the age of 19 to the age of 64, migration is very common, but more so among men. Of the 115 men from the age of 19 to 64, only 19 (17 %) remain in the area. On the other hand, of the 100 women in the same age category, 26 (26 %) remain in the area. Gender has an impact on migration, with more males migrating, even though China is a patrilineal and patrilocal society. Educational differences between males and females are minor, and cannot explain the gender difference in terms of migration. Males who are no longer in school have an average of 8.64 years of education, while females who are no longer in school have an average of 8.03 years of education. From the age of 65, virtually all people remain in the rural area. There is a strong desire among retirees to retire in the areas of origin, especially when they come from rural areas. This trend is likely to change in the future (Tang and Feng, 2015), since hukou residence rules reforms have made it easier for people with a rural hukou to gain urban hukou



–with the benefits that come with it– and settle in the urban areas (Brugiavini *et al.*, 2018). Factors that affected migration are discussed in the following section.

## 5.2. Factors affecting migration

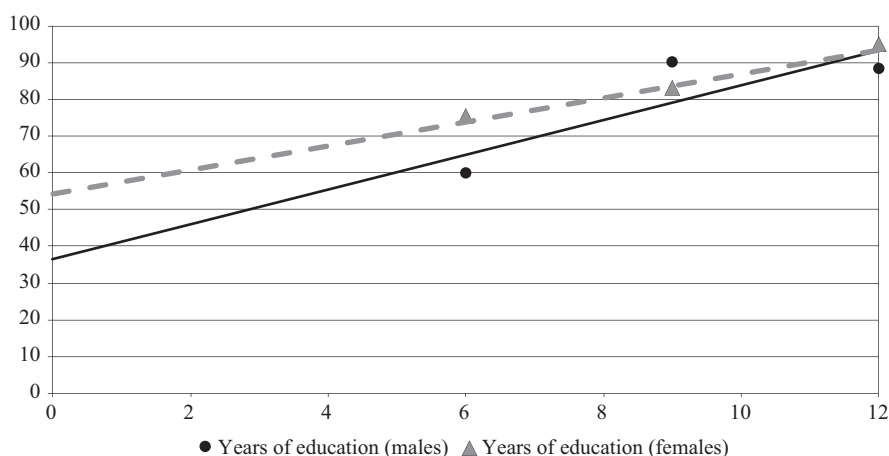
During the early 2000s, migration was facilitated by the ease to find employment in the rapidly developing industrial sector. However, the ability to migrate and work is not solely determined by one's willingness to migrate and by employment opportunities. It is also contingent on individuals' skills and training (Uchida *et al.*, 2009), connections and social capital, which may not be available to some people, as well as on endowments of household labour and amount of agricultural land. Five issues in particular are often considered when discussing the potential for household members to migrate. The farm household survey helps determine the importance of each of these factors in Pengshui County.

- 1) Capital necessary to finance migration. In this paper the wealth of the household from which migrants come from is not considered because migration took off in the early 2000s, and the small differences in wealth in rural villages (see below) would make a sufficiently accurate accounting of such historic data for statistical analysis a daunting task. However, since the GfG provided compensation to all migrants for setting aside their land, it directly addressed, at least partially, this potential constraint to migration.
- 2) Social capital and a social network outside the locality is very useful to find employment (Wan *et al.*, 2018). This issue was outside this paper's scope, since this research only looked at the trends in the locality itself. However, as mentioned above, it is likely that the GfG has contributed to expand the social network of participants and non-participants alike, since it encouraged the migration of participants, who in turn increased the social network of acquainted non-participants.
- 3) Education is often portrayed as an important factor in migration (Knight and Song, 2003). More years of formal education helps finding a (better paid) job, and therefore better educated people have a greater incentive to migrate. Figure 3 shows the likelihood of migration, that is, the number of people who migrated out of the total number of people, according to years of schooling. Only people who are no longer studying are included in this figure. In Figure 3, only people who studied 6, 9 or 12 years are included. A few people (11 people in total) studied for a different number of years, and are excluded. As Figure 3 shows, more educated people seem to engage more in migration, and this is valid for both females and males. Almost 88 % of males with 12 years of education migrated, and 94 % of females with 12 years of education migrated. The level of education clearly affects migration. Better education involves better employment opportunities.



- 4) Household size can be a factor affecting migration (Yan *et al.*, 2014). Larger households are more likely to have a surplus of labour, in particular in China, where rural households tend to have a similar amount of land. Thus, larger households are more likely to have a greater number of people who migrate. This is also the case in Pengshui County (Figure 4). This fact is clear up to households with 5 members (there are very few households with more than 5 members), and there is a strong tendency for one household member to remain in the village, while the others migrate. One should bear in mind that in some cases all members of some households may have migrated, in which case the households are not included in this survey.

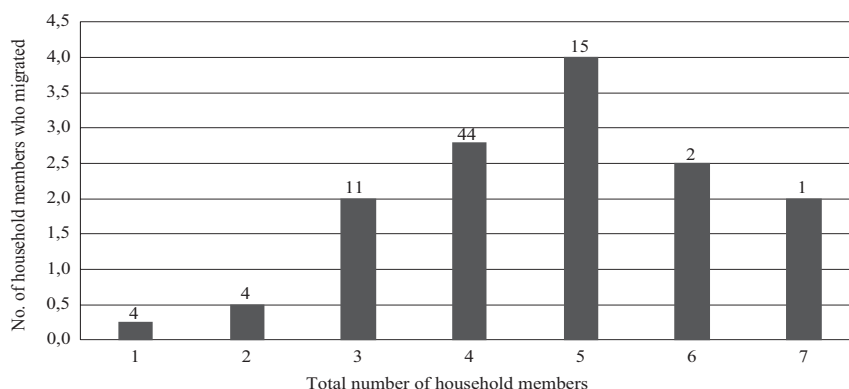
FIGURE 3  
Percentage of household members who migrate, considering years of formal education



Source: Survey's results and author's calculations.

The processes observed in China seem to be mostly in line with the existing literature. It must be stressed that China presents more socio-economic homogeneity than other countries. For example, the large latifundios and inequality in land access present in Latin America and elsewhere do not exist in China. One would be tempted to say that they were abolished with the Communist revolution in 1949, and that even the tumultuous history of land distribution, collectivisation and redistribution during the following decades, has prevented the accumulation of land by individual households. Households own between 1 and 7 mu, with 58 out of 81 households (72 %) having between 2.5 and 4 mu.

FIGURE 4  
Relationship between household size and average number  
of people who migrate



Note: The numbers above the bars denote the number of households.

Source: Survey's results and author's calculations.

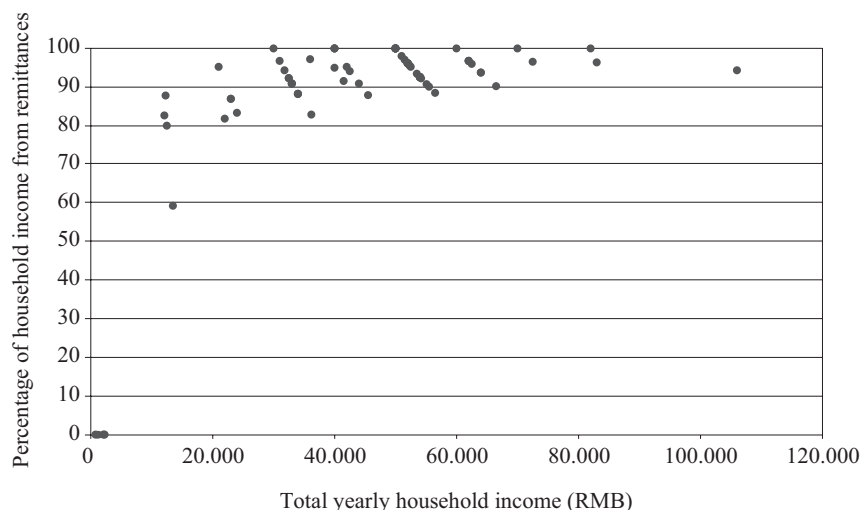
### 5.3. Farmers' incomes and remittances

The GfG has encouraged the migration of farmers, thereby changing the structure of the local economy. A number of researchers have attempted to quantify the impact, but most of them (e.g. Uchida *et al.*, 2009) have done fieldwork only one to three years into the program (even though the analysis may have been published later), when the full impact could not yet have been felt.

Since some of the land has been converted, and most of the adult population in working age have migrated, most incomes now come from remittances. Figure 5 shows that remittances constitute the greatest share of household incomes in the surveyed municipality. On average 88 % of total household incomes come from remittances, and most households obtain over 90 % of their total incomes from remittances (partly because incomes from agricultural activities are very low in China). Only a very small number of households have no remittances, and they subsist mostly on farming and government pensions. These conclusions are similar to those of Hori and Kojima (2008), who found that the income from migrant workers accounted for more than 70 % of non-agricultural income for households in 2004.

The average amount remitted is RMB 17,000 a year, or RMB 1,400 a month, per migrant worker. With a monthly average salary for unskilled worker of at least RMB 4,500 in most areas in China, the amount transferred seems both plausible and relatively high. Most of those who migrate are in the 19-64 age class, and since most of those who remained behind are children in school or elderly, it is likely that in most cases remittances are used to support livelihoods, rather than to invest in increasing agricultural output.

FIGURE 5

**Relationship between total household income and remittances**

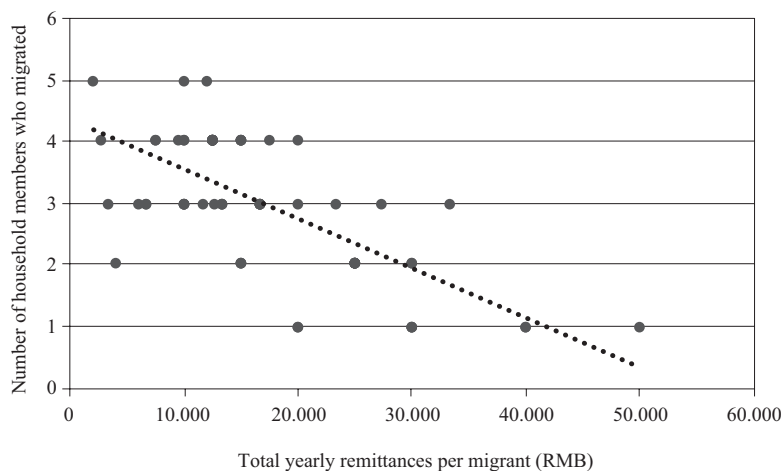
Source: Survey's results and author's calculations.

Figure 6 suggests that the more members of the household migrate, the less each member sends on average. There seems to be financial incentives for household members who migrated to encourage other household members to migrate, as this will lessen their burden. At the same time, it is understood that the needs for money in the rural area are finite.

The implication of Figure 6 is that the household income from remittances tends to level off. This is consistent with Figure 7, which indicates that the total amount remitted yearly steadies at about RMB 45,000 to RMB 50,000 a year if two or more members migrated. Although there are great variations among households, when two or more household members migrate, each member remits a proportionally smaller amount. Migrants only send as much as needed by those who remained behind. Most households have three to four migrants, so a remittance of RMB 50,000 a year corresponds to a monthly RMB 1,050 to 1,400 per migrant. When three or four migrants share the burden of such remittance, it is manageable.

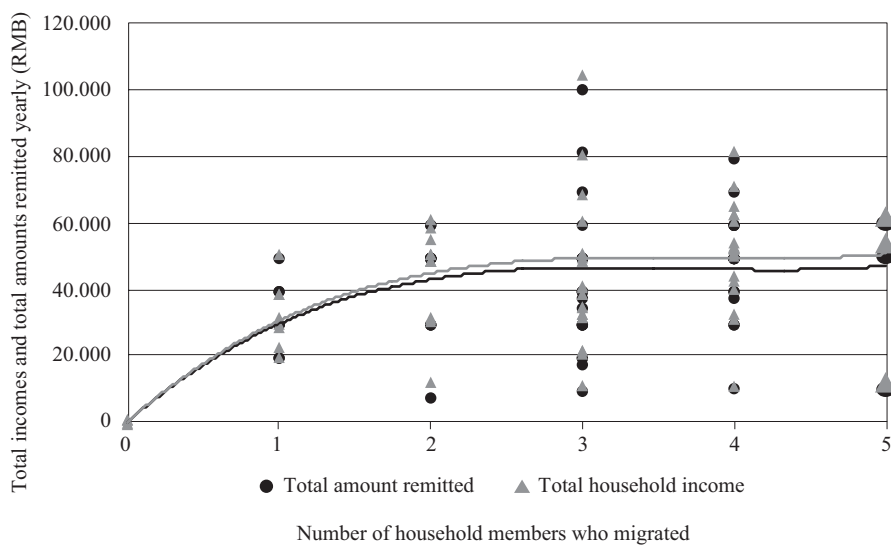
As for the influence of households' education, there seems to be a slight positive relationship between the average years of education of household members and the total yearly remittances received by the household (Figure 8). More year of education leads to slightly larger total remittances. However, this relationship is weak, and a better interpretation of the data is that migrants remit up to a fixed, limited amount, rather than a percentage of their income.

FIGURE 6

**Remittances per migrant vs. number of household members who migrated**

Source: Survey's results and author's calculations.

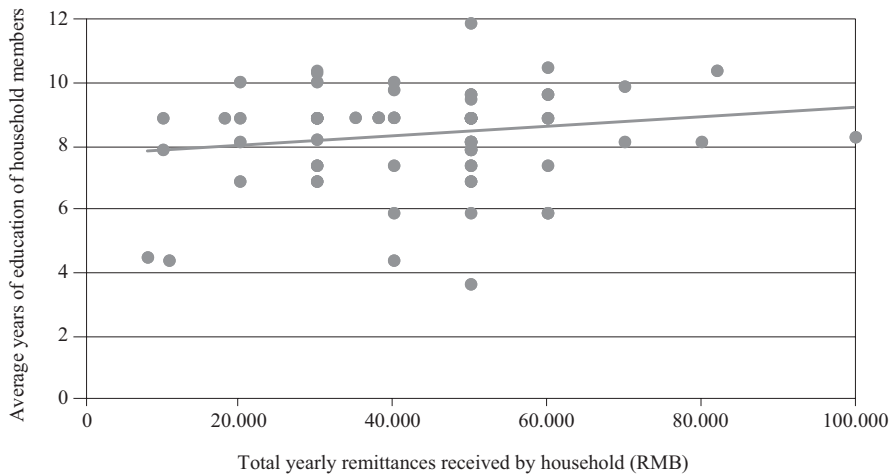
FIGURE 7

**Relationship between total yearly remittances and number of household members who migrated**

Source: Survey's results and author's calculations.

FIGURE 8

**Relationship between total remittances received by household and average years of education of all household members who are no longer in school**



## 6. Conclusions

This paper has given a snapshot of the conditions in one county in Chongqing Municipality among farmers who converted their land with the GfG. In spite of the local characteristics of the survey, these preliminary findings indicate some program's impacts related to migration and remittances to Chinese rural areas.

One research limitation in Chinese rural areas is that Chinese rural households and their possessions in any one county are rather uniform, and any statistical analysis is bound to have weak significance. Households tend to have a similar amount of land, because of the land distribution of 1949 and 1981, and the legal constraints towards land acquisition and land consolidation (Wilmsen, 2016). In addition, the household sizes was limited by the one child policy (relaxed under some conditions) that was instituted in 1979, and was only removed in 2016 (Feng *et al.*, 2016).

Nevertheless, the paper confirmed some processes suggested in the literature. For example, larger households and more years of formal education leads to more rural-urban migration. The paper also revealed other facts that may be less common in other countries. For most surveyed households, remittances made up over 90 % of total incomes. However, the total income remitted to households tended to level off at about RMB 45,000 to RMB 50,000 a year per household, if households have two or more migrants. This supports the hypothesis that the larger the number of migrants, the less each migrant will remit. In other words, there are no advantages to those who

remained behind to have larger households and more than two migrant members, but there are advantages for the migrants if more household members migrate.

The broader policy implications of this paper is that, in spite of the problems related to rural-urban migration, off-farm employment for migrant rural people is relevant for the sustenance of those who remained behind. Many migrant people work in the construction and labour-intensive manufacturing sectors. If these sectors were to collapse, and the remittances dried out, there would be considerable difficulties for those who remain in the rural areas. In addition, an economic crisis would force some migrants to return to the rural areas, and unconverted farmland is clearly insufficient to sustain their livelihoods. These considerations put additional pressure on the government to prevent the economy to slow down excessively.

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