How Are Rural Youths’ Agricultural Skills? Empirical Results and Implications in Southwest China

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Abstract: Global agriculture is facing an aging workforce and successor crisis, while the degradation of rural youths’ agricultural skills, which is indeed a concrete manifestation of young agricultural labor loss, has received little attention. Based on data from 1902 questionnaires in rural Southwest China, this study draws on a qualitative and quantitative analysis of the degradation of their skills to deepen the insights into the relationship between rural youth and agriculture. We found that rural youth have much lower agricultural skills than rural middle-aged and elderly residents, and their agricultural skills vary depending on gender, age, and occupation. Rural young non-agricultural workers’ large proportion among rural youth and low skills are the main sources of the reduction in rural youths’ skills. According to ordered logistic regression analysis, rural young non-agricultural workers who are older, have less education per person in their household, and have a larger cultivated land size have higher skills. As for rural students, 65.44% of the rural students have no skills, age and family’s agricultural income are significant positive influencing factors of their agricultural skills, and female youth have higher agricultural skills. The results provide references for policymakers to formulate targeted policies to cultivate rural young agricultural successors.

Keywords: agriculture; rural youth; succession crisis; rural revitalization; China

1. Introduction

Rural revitalization and food security are two important issues globally, both of which call for efficient and sustainable agricultural production [1]. Studies have shown that compared with middle-aged and elderly peasants, young peasants, who have higher levels of education, physical strength, flexibility, and adaptability, are more beneficial to agricultural development in the long run [2,3]. However, global agriculture is currently facing an aging labor force and successor crisis [4,5]. According to the 2017 Census of Agriculture data from the U.S. Department of Agriculture, the average age of farm producers in the United States is 57.5, up 1.2 years from 2012 (https://www.usda.gov/media/press-releases/2019/04/11/2017-census-agriculture-data-now-available (accessed on 8 August 2021)). In 2013, about 30% of European farms were managed by a farmer aged 65 years or older, and in some countries this figure was even higher [6]. Developing countries such as China [7], India [1], Brazil [8], and Tanzania [9] are also facing the problem of aging agricultural labor forces to varying degrees. Therefore, how to retain rural youths’ involvement in agriculture has become a worldwide concern of policymakers and scholars [6,10].

Research on rural youth’s agricultural skills plays an important role in understanding the mechanism of rural young agricultural labor drain. Agricultural skills have a very broad definition, including the skills necessary to perform activities or tasks in crop production, animal husbandry, forestry, fishery, processing, marketing, distribution, and/or the trading
of agricultural products. The skills discussed in this paper mainly refer to basic agricultural skills, such as applying pesticides, weeding, and fertilizing. Firstly, the agricultural skills of rural youth influence whether they will continue to participate in agricultural production and inherit family farms in the future. Fischer and Burton [11] argued that farm inheritance, as a socially constructed phenomenon, requires continuous participation in agricultural production and the socialization of farm heirs from early childhood to develop an ‘heir identity’, which influences the youth’s internal drive to take over the family farm. Their findings are consistent with those of Jean-Philippe et al. [12], who believed that rural youths’ mastery of agricultural skills affects their attitudes toward agriculture. Furthermore, rural land provides basic living security for rural residents in the form of agricultural production, which is the foundation of rural areas [7]. Rural youths’ lack of agricultural skills also means their loss of agricultural livelihoods, indicating changes in the human–land relationship that exists in rural areas. Finally, whether young people in rural areas have mastered agricultural skills indicates their families’ expectations for them and their livelihood strategies. Not being able to farm may result from their families wanting them to enter non-agricultural sectors to realize the family’s dream of becoming city dwellers. Conversely, in the case of rural young people who can farm, their family may want them to inherit and continue to work the land in the future [13,14].

Research on the relationship between rural youth and agriculture to date has primarily focused on the following aspects: (1) the willingness of rural youth to inherit family farms and its influencing factors [15,16], (2) the effects of rural youths’ participation in agriculture [3,17], and (3) the effectiveness of policies for promoting youths’ participation in agricultural production [3]. While the importance of agricultural participation has been emphasized by many researchers, and some related research has focused on rural women and children [18–20], there is a lack of deep quantitative empirical research on the degradation of rural youths’ agricultural skills levels and associated factors.

Our team has observed that a growing number of young people in rural areas lack agricultural skills, which are acquired on the family farm through everyday agricultural activities and passed on from generation to generation in China. Some rural youth are even resistant to agricultural production. The term ‘peasant’ is being used by some youth to describe a person who is not fashionable and does not accept new knowledge, which is evidence of their resistance to agricultural production [21]. Studies show that the average age of Chinese peasants is about 50 [10,22]. Such an aging agricultural labor force further reduces agricultural income and, at the same time, leads to a significant amount of abandoned farmland [23,24]. The aging workforce and successor crisis could be associated with the push–pull theory, with the pushing force of low income and instability in agricultural production and the pulling force of higher incomes and better working conditions of non-agricultural sectors [25,26]. China’s rapid development of industry incentivized a large number of young rural laborers to transfer to non-agricultural sectors, resulting in a mass influx of rural residents to cities and massive changes in rural regions [27–29]. In 2020, the total number of rural migrant workers in China is about 286 million, accounting for one-fifth of the entire Chinese population. Other developing countries, such as Vietnam and Thailand, also have large numbers of migrant workers due to their rapid industrialization. However, there is a lack of understanding of the basic situation of rural youths’ agricultural skills against the background of industrialization and their movement to cities, as well as the influencing factors and influencing mechanisms of the decline in agricultural skills among some rural youth. Even though the Chinese government has introduced some policies to attract migrant workers and rural college graduates to return to rural areas to start businesses, these policies have not targeted agricultural development, and the shortage of youth in the agricultural labor force has not been effectively alleviated [30,31].

Under this background, this study primarily focuses on the following two research questions:
What is the current state of rural youths’ agricultural skills?
What factors influence agricultural skills of rural youth and how?
The research data were collected using a questionnaire survey of 1902 rural residents in rural Southwest China. Based on these data, this study summarized the agricultural skills of youth and analyzed the characteristics of their agricultural skills. In addition, logistic regression analysis was used to study the factors that influence the agricultural skills of rural young non-agricultural workers (RYNWs) and rural students (RSs) among the participants. This research aims to identify the source of the exodus of young agricultural laborers and deepen the insights into the relationship between rural youth and agriculture. Additionally, the research results can provide references for policymakers to formulate targeted policies to cultivated agricultural successors. As the largest developing economy and a major agricultural country, research on agricultural development in China would also be a significant reference for other countries.

2. Materials and Methods

2.1. Study Area

The main study areas were the provinces of Yunnan, Guizhou, and Sichuan in Southwest China (Figure 1), which have a total area of 1,056,300 square kilometers, accounting for approximately 11% of China’s national territory. Compared with China’s eastern coastal areas, the region’s overall economy is relatively weak. These three provinces are key areas of China’s rural revitalization policy [32,33]. As a result of unbalanced urbanization and economic development, these regions have become the main source areas of migrant workers in China. According to the Sixth National Population Census of the People’s Republic of China, the proportion of the rural population living in Yunnan, Guizhou, and Sichuan is 83.55%, 81.19%, and 73.19%, respectively. The level of the rural population outflow of these three provinces is high in China, especially that of the Guizhou Province, which accounts for 1.75% of its total population.

Figure 1. Location of study area.

Agriculture plays an important role in this region. According to the China Statistical Yearbook 2019 (http://www.stats.gov.cn/tjsj/ndsj/2019/indexch.htm (accessed on...
10 March 2021)), among all provincial administrative regions in China, these three regions’ primary industry outputs are ranked 5th, 4th, and 8th, respectively. Furthermore, mountainous and hilly terrains account for 93.6%, 84.50%, and 92.5% of these provinces’ total land area. Meanwhile, poor mountainous areas are widely distributed, and due to the terrain the degree of agricultural mechanization is low in this area. The six sample counties in the three provinces surveyed all have large agricultural scales and dominant agricultural products. Yangbi County, one of the sample counties in Yunnan Province, was identified as an advantageous production area of agricultural products with Chinese characteristics by the Ministry of Agriculture and Rural Affairs of China. The Yangbi walnut is a national geographic indication product in China, and nearly 405 km$^2$ of walnuts are certified as organic agricultural products. Yuanmou County, another sample county in Yunnan Province, mainly plants tomatoes, onions, cucumbers, and green corn. In Fuquan (sample county in Guizhou), the pepper planting area and ginger planting area are nearly 405 km$^2$ and 81 km$^2$, respectively. Renhuai’s (sample county in Guizhou) agricultural production centers around Chinese baijiu. The organic sorghum base area and organic wheat base area in Renhuai are both more than 1012 km$^2$. Yanting County’s pepper plantation area is 324 km$^2$, fruit plantation is 445 km$^2$, walnut plantation is 607 km$^2$, and Chinese herbal medicine and mulberry plantation is 142 km$^2$ and 61 km$^2$, respectively. Nanjiang County planted 1617 km$^2$ of honeysuckle and slaughtered 40,000 goats in 2019. Overall, the characteristics of these regions show that they are highly consistent with our research objectives and reflect the current situation in rural China.

2.2. Defining Youth

‘Youth’ has no uniform definition in current academic research. The European Union’s Young Farmers Survey limited the age of its respondents to 35 [3]. In other studies on rural youth, this group has been defined as individuals between 18 and 40 years of age [34,35]. In medical studies, youth are often defined as individuals aged between 10 and 24 years [36].

Under China’s hukou (household registration) system of peasant residents, rural laborers were not allowed to work in non-agricultural industries until 1982. Therefore, only rural residents born after this policy was implemented were affected by the migration of rural laborers. Some studies showed that some left-behind children, who were cared for by a single parent or grandparents, usually residing in rural areas while their parents sought employment in cities, were deeply engaged in agricultural production [37,38], which was in line with the fact that the minimum age to carry out agricultural production independently in the preliminary survey was 10 years old.

Therefore, in this study, considering China’s hukou system and rural development background as well as the availability of data, rural youth is defined as the people aged between 10 and 40 who have registered as permanent rural residents. It includes youth who are temporary workers in factories and migrant students with rural hukou, but does not include state workers with rural hukou (Figure 2).

2.3. Sampling Procedure

This study adopted a multistage, stratified sampling method. First, considering the diversity of altitudes, terrains, and economic as well as agricultural development levels, two counties were selected as the survey areas in each province (Figure 1). Second, for each county, three towns located at different distances from the center of the county were selected to conduct household questionnaire surveys. In each town, around 100 residents were randomly selected as respondents. The surveyors visited two or three villages in the town to conduct household surveys. This sampling method ensured that the questionnaire collection was comprehensive. The surveyors had bachelor’s degrees or higher in related fields, lived full-time in the area, and had mastered the regional dialect, thus ensuring smooth communication with the rural residents. The survey was conducted from June to August 2019, and each interview lasted from 40 to 60 min.
The respondents were rural residents aged between 10 and 70 years; the rural youth group consisted of those between 10 and 40 years old, as mentioned above, while the reference group comprised of those between 41 and 70 years old. A total of 2012 questionnaires were collected, of which 1902 were valid. Among them, the rural youth group included 859 participants and the reference group 1043.

**Figure 2. The sampling procedure.**

### 2.4. Questionnaire Contents

The questionnaire included information concerning the participant’s level of agricultural skills and their potential influencing factors. To our knowledge, the current literature has not yet defined what constitutes the level of mastery in agricultural production, so the classification adopted in this study was derived primarily from the research team’s long-term communication and experience with peasants. In accordance with the summary of peasants’ mastery of agricultural production skills, this study divided the level of mastery into three levels:

- **Type A** refers to full mastery, indicating that the labor force can conduct agricultural production and management independently.
- **Type B** is general mastery. This level of mastery allows one to perform the duties of an assistant in agricultural production.
- **Type C** indicates the mastery level of those who have never participated in any agricultural production activities and have not mastered any agricultural skills.

For the convenience of data analysis, this study assigns the three mastery levels scores of 2, 1, and 0, respectively.

Based on existing studies concerning the influencing factors behind rural youths’ inheritance of family farms [19,39,40], and our group’s experience and research interest, this study selected potential factors that may affect rural youths’ mastery of agricultural skills from the perspectives of personal and family characteristics and the situation of their families’ agricultural operation. The potential influencing factors are shown in Table 1. In the selection of personal characteristics, since students’ age is linearly related to their educational level, only age was selected as a factor. Meanwhile, since few students have mastered non-agricultural technical skills, the associated factors were also deleted from the students’ personal characteristics.
Table 1. Potential factors.

| Variable Type       | Number | Variable Name | Variable Explanation                                                                 | Students | Non-Agricultural Workers |
|---------------------|--------|---------------|--------------------------------------------------------------------------------------|----------|--------------------------|
| P1                  | Sex    | 1 Male, 0 Female |                                                                                     | ✓        | ✓                        |
| P2                  | Age    | The respondents’ age |                                                                                     | ✓        | ✓                        |
| P3                  | Educational level | Illiteracy = 0  
Primary school = 1  
Junior middle school = 2  
Polytechnic school = 3  
Senior high school = 4  
Junior college or above = 5 | ✓        |                          |
| P4                  | Non-agricultural skills | Have you received an apprenticeship or long-term training?  
Yes = 1  
No = 0 | ✓        |                          |

**Personal characteristics**

| Variable Type       | Number | Variable Name | Variable Explanation                                                                 | Students | Non-Agricultural Workers |
|---------------------|--------|---------------|--------------------------------------------------------------------------------------|----------|--------------------------|
| F1                  | Education level | Per capita educational level in families:  
Illiteracy = 0  
Primary school = 1  
Junior middle school = 2  
Polytechnic school = 3  
Senior high school = 4  
Junior college or above = 5  
F1 = (n1 + n2 + ... )/family size | ✓        | ✓                        |
| F2                  | Family income | Total family income per year (RMB) | ✓        | ✓                        |
| F3                  | Family workforce | Total family workforce score: F3 = n1 + n2 + ... | ✓        | ✓                        |

**Family characteristics**

| Variable Type       | Number | Variable Name | Variable Explanation                                                                 | Students | Non-Agricultural Workers |
|---------------------|--------|---------------|--------------------------------------------------------------------------------------|----------|--------------------------|
| A1                  | Cultivated land size | The size of cultivated land planted by the family, including the contracted cultivated land of the family and the land rented by them but excluding abandoned land (unit = mu) | ✓        | ✓                        |
| A2                  | Livestock | The total number of livestock raised in the family. According to the difficulty of breeding and amount of food, the coefficients of different livestock were assigned as follows:  
pigs = 1; chicken, ducks, and geese = 0.05; sheep = 0.5; cattle = 4 | ✓        | ✓                        |
| A3                  | Agricultural income | The proportion of agricultural income in the total household income:  
agricultural income/family income = A3 | ✓        | ✓                        |

1 0 = those below 10 years of age/with a serious illness/80 years old or above/suffering from chronic diseases between 75 and 80 years of age; 1 = those aged 75 years or older and occasionally suffering from a minor illness/suffering from chronic diseases between 60 and 75 years of age/with a healthy body between 10 and 15 years of age; 2 = those between 60 and 75 years of age and occasionally suffering from a minor illness/with a healthy body between 15 and 18 years of age; 3 = those aged 18 years or older/under 60 years old and suffering from chronic diseases/with a healthy body between 15 and 18 years of age who have dropped out of school; 4 = those with healthy bodies between 18 and 60 years of age.
2.5. Data Analysis

Descriptive statistical analysis was used to analyze the overview of rural youth’s agricultural skills. The study mainly discusses the agricultural skills of rural youth with different characteristics from the perspectives of gender, age, and occupation, and compares the agricultural skills of rural youth with those of middle-aged and elderly rural residents through comparative analysis.

Logistic regression analysis is widely used in the analysis of factors affecting the willingness and behavior of individuals. The dependent variable (rural youths’ agricultural skills) was a tripartite variable, and the regression models of RSs and RYNWs passed the parallel test and were found to be significant ($p_{RS} = 0.444, p_{RYNW} = 0.468 > 0.001$), indicating that the data of the two groups conformed to the requirements of the ordered logistic regression model. Therefore, ordered logistic regression analysis was performed for each group to analyze the influencing factors.

3. Results

3.1. Overview of Rural Youths’ Agricultural Skills

The overall mastery level of rural youths’ agricultural skills was relatively low, and its structure presented polarization, as shown in Figure 3. Among the 859 rural youths surveyed in this study, 65.66% had mastered agricultural skills, while 34.34% had neither mastered any agricultural skills nor participated in any agricultural activities. According to the quantitative standard, the average agricultural skills level of rural youth was 1.08, and the standard deviation was 0.87. This indicated that they could only assist in agricultural production, and could not conduct agricultural production independently. Meanwhile, 42.14% of rural youth were able to conduct agricultural production and management independently (Type A). However, the proportion of the Type C (i.e., no mastery of agricultural skills) rural youth group was also high, accounting for 34.34% of the total rural youth population. Only 23.52% of rural youth had a Type B level of agricultural skills.

![Figure 3. Characteristics of rural youth with different agricultural skills.](image-url)
Compared to the reference group, the rural youths’ level of agricultural skills mastery had noticeably declined. Among the rural middle-aged and elderly residents (RMERs), more than 99% had mastered agricultural production skills. Their average level of agricultural skills was 1.96, which was very close to the highest level, and the standard deviation was only 0.22. Specifically, 96.84% of RMERs could perform agricultural production activities independently (Type A), 2.4% could assist with auxiliary agricultural production (Type B), and only seven of them had not mastered any agricultural skills (Type C), accounting for 0.67% of the surveyed RMERs. Of the seven RMERs who were not capable of agricultural production, five were unable to engage in it due to either a physical disability or a mental illness.

As indicated by a Mann–Whitney U test (p = 0.000), the levels of agricultural skills differed significantly between the rural youth and the reference group. Comparing the rural youth group with the reference group, the number of people who had not mastered agricultural skills had increased by 33.67%, while the average level of agricultural skills had decreased by 44.89%. Meanwhile, the individual differences in the level of agricultural skills among the youth were also greater than those among RMERs.

3.1.1. Gender Differences

In the survey, 31.98% of rural young males (RYMs) had no agricultural skills and had not participated in any agricultural activities, while the corresponding figure for rural young females (RYFs) was 37.02%. In Figure 3, it can be observed that RYFs’ participation in agricultural activities and basic agricultural skills were slightly weaker compared to RYMs. Specifically, the average agricultural skills level of RYFs was lower compared to RYMs (1.12 and 1.03, respectively). The individual differences in terms of RYFs’ agricultural skills were slightly larger compared to RYMs, with standard deviations of 0.87 and 0.86, respectively. Among RYMs, 44.36% had Type A agricultural skills, and 23.65% had Type B skills. Among RYFs, Type A accounted for 39.66% and Type B for 23.32% of participants. The Mann–Whitney U test showed no significant differences between the agricultural skills of RYM and RYF (p = 0.112).

Conversely, according to the Mann–Whitney U test (p = 0.048), agricultural skills differed significantly between rural middle-aged and elderly males (RMEMs) and females (RMEFs). In the rural elderly group, only 0.93% of RMEMs and 0.30% of RMEFs did not have any agricultural skills. The average agricultural skills level of RMEMs was 1.95, while that of RMEFs was 1.98. Additionally, 98.02% of RMEFs were capable of independent agricultural production, compared to 95.92% of RMEMs. The proportion of Type B agricultural skills accounted for 1.58% and 3.15% of RMEFs and RMEMs, respectively. The participation rate in agricultural activities and agricultural skills level among RMEFs were slightly higher than among RMEMs. Compared with RMEFs and RMEMs, the agricultural skills level of RYFs had decreased more than that of RYM.

3.1.2. Age Differences

The minimum age for acquiring the three different types of agricultural skills among rural youth is 10 years, and the maximum age is 40 years, which is the same as the age range defined for this study. The average age for each mastery level was as follows: 31 for Type A, 23 for Type B, and approximately 20 for Type C. The rural youth group was divided into three subgroups with an age interval of 10 years, as shown in Figure 3. Among the rural youth, different age groups differed significantly in terms of their agricultural skills. For the age group between 10 and 20 years, the average level of agricultural skills was 0.45, and 63.23% of them had neither participated in any agricultural activities nor mastered any agricultural skills. The proportion of those who had mastered auxiliary agricultural skills was 28.87%, but only 7.90% possessed independent agricultural skills. For the age group between 21 and 30 years, 27.93% of them did not have any agricultural skills, while 25.17% and 46.90% of rural youth possessed Type B and Type A levels of agricultural skills, respectively. In this age range, the agricultural skills were evenly distributed. Between the
ages of 31 and 40 years, only 10.79% of participants did not have any agricultural skills, and 73.02% had the capacity for independent agricultural production. In this age group, the level of agricultural skills was relatively high but still lower than that of RMERs.

However, when RMERs were segmented according to the same criteria used for the rural youth, the results revealed that the level of agricultural skills was similarly distributed across the different age groups.

3.1.3. Occupational Differences

Among RSs, the average mastery level was only 0.41, with a standard deviation of 0.61. Figure 3 shows that, specifically, only 13 RSs (4.78%) had fully mastered agricultural skills; 178 students, accounting for 65.44% of RSs, had no agricultural skills whatsoever; and 29.42% of RSs had Type B mastery. All of the peasants in the rural youth group had mastered some agricultural skills, and the average level of agricultural skills was 1.85, the highest among occupational classifications, with a standard deviation of 0.36. However, 14.90% of young peasants were still unable to manage agricultural production independently. Among RYNWs, the average level of agricultural skills was 1.15, which meant that they could not perform agricultural production independently but could effectively assist in some agricultural production activities. Compared with the rural young peasants, the RYNWs’ level of agricultural skills had decreased by 0.70. Specifically, in terms of their agricultural skills, 29.86% of RYNWs had none, 46.03% had completely mastered them, and 26.84% had Type B level of agricultural skills. Comparing the agricultural skills of RYNWs and non-agricultural workers in the reference group, the average level of non-agricultural workers in the reference group was 1.88 and that of the RYNWs was 0.73, showing a significant downward trend. Additionally, the Mann–Whitney U test revealed that the level of agricultural skills differed significantly between the two groups ($p = 0.000$).

3.2. Factors Affecting the Level of Mastery

3.2.1. Students

The ordered logistic regression model of the students’ group was significant ($p = 0.000 < 0.001$). Table 2 shows that, among the eight potential influencing factors, three factors significantly influenced students’ agricultural skills level, namely two personal characteristics (age and gender) and one factor concerning the family’s agricultural operation status (the proportion of a family’s agricultural income).

| Factor Numbers | Variable Name                  | Students $\beta$ | Non-Agricultural Workers $\beta$ |
|----------------|--------------------------------|------------------|----------------------------------|
| P1             | Sex                            | $-0.699 **$      | $-0.266$                         |
| P2             | Age                            | $2.286 ***$      | $2.104 ***$                      |
| P3             | Personal education level        | $-0.164$         |                                  |
| P4             | Non-agricultural skills         | $-0.012$         |                                  |
| F1             | Family educational level        | $0.704$          | $-2.771 ***$                     |
| F2             | Family income                  | $-1.384$         | $-0.367$                         |
| F3             | Family workforce level          | $-0.794$         | $0.133$                          |
| A1             | Cultivated land size           | $1.202$          | $1.992 **$                       |
| A2             | Livestock number               | $0.215$          | $0.425$                          |
| A3             | Agricultural income             | $0.016 ***$      | $0.000$                          |

**, $p < 0.01$; ***, $p < 0.05$.

Specifically, the significance of age in the model was $p = 0.003$ and the influencing coefficient of age was $\hat{\beta} = 2.286$, meaning that the older students had a higher level of mastery over agricultural skills. Additionally, the absolute value of the coefficient was the largest among all the potential influencing factors. Gender was significant ($p = 0.012$),
and the influence was negative ($\beta = -0.699$), which meant that female students were more inclined to have a higher level of mastery over agricultural skills. In terms of family characteristics, the overall situation of the labor force in a family negatively impacted the students’ ability to master agricultural skills, indicating that the more abundant the labor force is in a family, the lower the level of the student’s agricultural skills within that family. However, this effect was insignificant ($p = 0.308$). The average educational level of all family members and the total family income had no significant effect on the students’ mastery of agricultural skills ($p = 0.308$ and $p = 0.135$, respectively). In the case of family agricultural operations, the proportion of a family’s agricultural income had a significant positive effect on students’ agricultural skills ($p = 0.000$, $\beta = 0.016$). In other words, a higher income level in family agricultural operations meant that their level of agricultural skills was also higher. Although the cultivated land size and number of livestock in a family had a positive impact on the level of students’ agricultural skills mastery ($\beta = 1.202$ and $\beta = 0.215$, respectively), the effect was insignificant.

3.2.2. Rural Young Non-Agricultural Workers

The RYNW group’s ordered regression model was significant ($p = 0.000 < 0.001$). The regression result in Table 2 shows that, among the 10 potentially influential factors, the following had a significant influence on RYNWs’ level of agricultural skills: age (personal characteristic), family education level per capita (family characteristic), and cultivated land size (family agricultural operation status).

Specifically, age was the most significant factor ($p = 0.000; \beta = 2.104$). In other words, older RYNWs had mastered agricultural skills to a greater degree. Other personal characteristics, such as gender and non-agricultural skills levels, had no significant effect on the agricultural skills level of RYNWs. In this study, both the educational level of RYNWs and the average educational level of all their family members were analyzed as potential influencing factors. The results showed the educational level of RYNWs had a negative effect on their agricultural skills level, but the influence was insignificant ($p = 0.201; \beta = -0.266$). The average educational level of all family members, however, had a significant negative effect on RYNWs’ level of agricultural skills ($p = 0.001, \beta = -2.771$). Additionally, among the 10 potential influencing factors, the absolute coefficient value of this factor was the largest. Another two family characteristics, the family’s overall labor force level and total income, had no significant impact on the level of agricultural skills of RYNWs. Among the factors concerning family agricultural operations, both the number of livestock raised in a household and the proportion of agricultural income had positive impacts on the level of RYNWs’ agricultural skills mastery ($\beta = 0.425$ and $\beta = 0.000$, respectively). However, these two factors were not statistically significant. The cultivated land area of the family had a significant positive influence on the agricultural skills mastery of RYNWs ($\beta = 1.992, p = 0.025$); that is, it was higher when the family’s cultivated land area was larger.

4. Discussion

4.1. RYNWs’ Agricultural Skills

Previous studies have discussed the demographic characteristics and related immigration driving factors of RYNWs, while this paper further explored the density of their relationship with agricultural production. According to our findings, most RYNWs can only perform some auxiliary agricultural activities, and have a significantly lower skills level (1.15) than rural young peasants, all of whose agricultural skills level is 3. Additionally, among the survey participants, RYNWs accounted for 43.77% of the rural youth group, while young peasants accounted for only 24.21%. Meanwhile, in the RMER group, only 21.44% of the rural middle-aged and elderly people were non-agricultural workers, which was less than half of the proportion in the rural youth group. Therefore, it can be considered that the decline of RYNWs’ agricultural skills and the increased proportion in the number of RYNWs led RYNWs to become the main source of rural youths’ agri-
cultural skills reduction. In recent years, many Chinese citizens have held a low opinion of agriculture; ‘de-agriculturalization’ is, in fact, the goal of many rural youth [41]. As a result, rural households have redistributed limited household labor, and a large number of young people have taken part in non-agricultural production to earn higher incomes, while the mastery of agricultural skills that do not lead to commensurately high incomes was left behind. Comparing the agricultural skills of RYNWs and RMERs who participated in non-agricultural industries, we could also see a significant decline. The influence of policy factors on this phenomenon cannot be ignored. As mentioned above, rural laborers were not allowed to go out to work in other sectors, so the rural population was deeply involved in agricultural production and mastered agricultural skills. These farmers with agricultural skills did not go to cities to work until policy (mentioned in Section 2.2) allowed them to do so, which is different from the youth of today.

The ordered regression results of RYNWs indicated that non-agricultural skills levels had no significant effect on the agricultural skills level of RYNWs. Relevant studies have also found that there are many young people in the countryside who have neither agricultural skills nor non-agricultural skills [34]. With no non-agricultural skills, it is difficult for them to find a job in the city. At the same time, it is also hard for them to achieve development in agriculture if they have no agricultural skills or only a low level agricultural skills. Because of the lack of agricultural development projects that aim to help these youth to develop the right attitude toward agriculture, and enable them to successfully and sustainably perform activities or tasks in agriculture, they might become an unstable factor for urban and rural social development. Therefore, special attention needs to be paid to the cultivation of agricultural skills, especially for rural youth with low levels of education and skills. At present, although there is non-scheduled agricultural skills training, this training usually focuses on the planting technologies of specific kinds of crops, rather than cultivating and improving rural youths’ agricultural skills.

4.2. Agricultural Skills of RYFs

The gender differences in rural youths’ agricultural skills levels are also notable. This study found that RYFs’ agricultural skills have decreased more rapidly than those of RYMAs, and the proportion of RYFs who have completely mastered agricultural skills has decreased significantly compared with REMFs. These two significant downward trends may be related to the social norm of gender division and changing rural labor policies. In mainstream society, men are always regarded as family breadwinners, while women are less involved in production [42–44]. Influenced by this idea, during the early days of China’s opening-up policy, it was primarily men who left rural areas to participate in non-agricultural industries [45,46], while the women who remained in the rural areas were forced to take on agricultural production responsibilities, improving their agricultural skills in the process [47,48]. However, in recent years, more non-agricultural employment opportunities were provided to women, leading to an increasing number of RYFs working in the cities [49]. Meanwhile, some rural areas have different degrees of discrimination against women, including their rights and interests in terms of land contracts, which exist in rural areas in many developing countries [50]. Under this double effect, RYFs’ status in agriculture has gradually decreased. This finding is consistent with research on women’s recognition in agriculture in several countries [51].

During the survey, the research team noticed that those who had received existing agricultural entrepreneurship support were mostly RYMAs, which may have been due to the decline in RYFs’ agricultural skills, as mentioned above. This will further affect females’ development in agriculture and create a vicious cycle. Numerous studies have demonstrated the importance of women’s participation in agricultural development [32]; it is necessary to put practical measures in place as soon as possible to stop the continued decline of RYFs’ skills in agriculture. According to this study and other related research, first and foremost, women’s land rights should be respected so that they can continue to participate in more agricultural activities to improve their agricultural skills.
specialized organizations with RYFs to help them to join the agricultural industry could be a possible supplementary measure [43].

In this study, the results of the regression analysis showed that gender was also a significant factor in RSs’ ability to master agricultural skills, illustrating that female students were more likely to have higher levels of agricultural skills. Specifically, more female students had mastered adjuvant agricultural skills, while the male students were rarely involved in agricultural production. The reason for this difference could be that boys are commonly preferred to girls in rural areas [53]. In some traditional Chinese cultures, a woman who gets married is considered to be a laborer in her husband’s family, which means the education of a girl does not benefit the family into which she is born. Since most girls’ school education is not taken seriously by families, they become involved in agricultural production and master auxiliary agricultural skills. In contrast, boys’ education is valued more by the entire family, so they do not participate in agricultural production to the same extent. The results are similar to those of relevant studies on rural students’ participation in housework activities [54, 55]. Tang et al. [54], who found that exposure to free compulsory education significantly reduces the incidence of child labor for boys, also found that it has no significant effect on the likelihood of child labor for girls. From the analysis above, we can see that after schooling ends, affected by the land and labor force division in their own and their husbands’ families, RYFs, though with auxiliary agricultural skills, do not have the opportunity to manage their land, let alone pursue agricultural development. Therefore, their agricultural production skills remain limited. As a result, the status of rural women in agriculture continues to decline. These findings emphasize the importance of paying attention to the development of RYFs and how the phenomenon of preferring boys remains a significant issue in rural China.

4.3. The Balance between Study and Agricultural Activities among RSs

In this study, most RSs (65.44%) were not engaged in agricultural activities and did not have any agricultural skills; their average mastery level was only 0.41. Although some 10-year-old students had fully mastered agricultural skills, this only represented a small fraction. We can conclude that the current agricultural participation rate of RSs in China is relatively low, and their level of agricultural skills is poor. This could be attribute to the current educational concept. At present, both the education received from teachers in schools and the upbringing by parents in families strongly emphasize the importance of studying [56]. There is also a sacredness of urban lifestyles and a devaluation of rural livelihoods in education today [57]. These concepts create ample study time for RSs but also alienate them from agriculture, thereby reducing their chances of learning rural livelihood skills. This weakens RSs’ connection with rural areas, further reducing the possibility of engaging in agriculture in the future [6].

In fact, in the survey, the agricultural skills of RSs with university education and above are all Type A. It is difficult for students in rural China to achieve this level of education [58], so it can be considered that participation in auxiliary agricultural activities will not negatively impact students’ academic performance. Therefore, while emphasizing the importance of education, RSs should be encouraged to not avoid but rather participate moderately in agriculture. Some countries have taken measures to integrate the learning of agricultural skills into basic education to train agricultural successors [59]. This will not only help rural students develop a positive attitude towards agriculture and agricultural production methods, but also help meet the future development needs of nations [57].

According to the ordered logic regression results, age positively influences a person’s level of agricultural skills among RSs. In other words, the older the RSs were in this survey, the higher their level of mastery of agricultural skills was. This is consistent with studies on the intensity of students’ participation in household activities, including agricultural production activities [60]. The potential reasons for this could be the characteristics of agricultural production activities. Since agriculture is labor-intensive, older students have greater physical strength and can participate in more agricultural activities. In addition,
the model results show that the higher the family’s proportion of agricultural income, the more likely the students are to master more agricultural skills. In the relevant research on the willingness of rural youth to inherit family farms, the proportion of family agricultural income was also positively correlated with this [61]. Combining the results of the two studies, we could conclude that this is a chain-promoting relationship: that is, rural families with higher agricultural incomes have more confidence in the agricultural industry, so they want to train their children to inherit the business.

It is also worth mentioning that the level of the family labor force and the overall family income do not significantly affect the level of students’ agricultural skills. This may be due to rural education reform, which has helped a large number of RSs gain access to different types of government funding to complete their studies at all stages [55]. The phenomenon of students’ excessive participation in agricultural labor to support their tuition no longer appears relevant.

4.4. Remaining Issues and Development Proposals

There are some limitations to this study. While this study mainly considered factors within the family, the community’s agricultural development may also impact rural youths’ agricultural skills. Therefore, exogenous factors, such as the community’s GDP of the primary industry and the proportion of the peasants in the region, should also be considered in future studies. The research team also plans to add the survey content of rural youth worksites in a future survey, as rural youth who work closer to the farmland site may have a mix of agricultural and non-agricultural work. Lastly, the definition of the mastery of agricultural skills is still relatively rough; we suggest that in future studies agricultural skills should be further refined, such as into technical skills and physical skills.

5. Conclusions

It is clear that the current aging workforce and succession crisis of agriculture is at odds with rural revitalization needs around the world. This study focused on rural youths’ agricultural skills and related factors, aiming to fill the research gap in this specific field and provide insights into young agricultural labor loss and the complexity of changing rural areas, which can assist policymakers and agricultural advisors in developing a deeper understanding of the process so as to solve the succession crisis.

Our results showed that, in rural Southwest China, not only are rural youths’ current overall mastery of these skills poor, but there is also polarization in their mastery levels, meaning a higher proportion of people who have either complete agricultural skills or a lack of agricultural skills. The increasing number and decreasing agricultural skills of RYNWs make them a main source of the decline in rural youths’ agricultural skills. At the same time, we found that there was no significant relationship between the mastery of non-agricultural skills and the level of agricultural skills among RYNWs, indicating that there may be a group of rural youth who do not have any livelihood skills. Therefore, we recommend focusing on those unemployed youth in rural areas who do not have agricultural skills and carrying out targeted agricultural skills training.

Gender is a significant factor affecting agricultural skills acquisition. Under the influence of rural residents’ preference for boys over girls, female students in rural areas have mastered some auxiliary agricultural skills, while rural male students are less involved in agricultural production. When school ends, since they have fewer land rights, RYFs do not have the opportunity to pursue further agricultural development; their agricultural skills remain limited. Based this study and other related studies, policies should protect rural women’s rights to land in order to remove the most essential barrier to RYFs’ agricultural development.

Most RSs (65.44%) did not have any agricultural skills, which also contributed to the agricultural skills reduction in rural youth. Supported by changes in educational concepts and Chinese childbearing policies, the rate of participation in agricultural activities and the level of agricultural skills among RSs is significantly low. Among them, older students
have a relatively higher level of agricultural skills. We also found that the higher the family’s proportion of agricultural income, the more likely the students are to master greater agricultural skills. This indicates the family’s confidence in agriculture and future livelihood strategy. On that basis, we also recommend that rural students get involved in agriculture appropriately, or incorporate agricultural skills into their daily education as is being attempted in some other countries.

According to the results of qualitative and ordered logistic regression analysis, age is also an important influencing factor. Among surveyed rural youth, older youth had a higher agricultural skills level. The potential reasons for this could be the characteristics of agricultural production activities. Since agriculture is labor-intensive, older youth have greater physical strength and can participate in more agricultural activities. In addition, rural youth are increasingly affected by urbanization, which can also be verified by the fact that the average age of young farmers is 32, while the average age of non-agricultural workers is only 29. **Author Contributions:** All authors contributed to the study conception and design. Material preparation and data collection were performed by Y.Z., M.L., Q.L. and K.Y. Concept design and funding support were provided by Y.W., B.F. The first draft of the manuscript was written by Y.Z. and all authors commented on previous versions of the manuscript. Y.W., B.F and Q.L. helped revise the manuscript. All authors have read and agreed to the published version of the manuscript.

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**Glossary**

- **RYNWs**: Rural young non-agricultural workers
- **RSs**: Rural students
- **RMERs**: Rural middle-aged and elderly residents
- **RYMs**: Rural young males
- **RYFs**: Rural young females
- **RMEMs**: Rural middle-aged and elderly males
- **RMEFs**: Rural middle-aged and elderly females

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