Research article

Household Income Diversity of Small-scale Cassava Producers in Vietnam

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Abstract This study clarifies how small-scale cassava producers endeavor to stabilize their household income. We conducted the survey between April and December 2017 in Dong Nai, Tay Ninh, and Gia Lai provinces, which are major cassava-producing provinces; 182 small-scale cassava producers were randomly selected for interviews. According to the results, each household has 4.5 members, of which 2.1 are involved in cassava production. The average household income was $7,071.29 per year, while the average income per employee was $3,535.15, which is 36.8% less than the average income of Vietnamese employees. The primary income is derived from two sectors: $3,648.41 (51.59%) and $3,422.88 (48.41%) from agricultural and non-agricultural incomes, respectively, along with $25.0 (0.4%) and $14.7 (0.2%) from remittance and pensions, respectively. Further, the cassava income shared 23.57% and 12.16% of agricultural and total household incomes, respectively, with an average of $859.81. As their primary sources of income, some small-scale cassava producers produce industrial crops, such as rubber trees, sugarcane, cashew, tobacco, and acacia. Moreover, they produce vegetables and fruits and engage in animal husbandry activities and agro-processing. In terms of non-farm income, they work as hired laborers and receive a stable income from the government or private companies. Thus, small-scale cassava producers in Vietnam stabilize their household income with multiple income sources and do not rely heavily on cassava.

Keywords cassava, production, producers, socioeconomic status, income, Vietnam

INTRODUCTION

Vietnam is a lower middle-income country; however, its economy has grown by an average of approximately 6.7% annually since Doi Moi (renovation) in 1986 (Cameron et al., 2020). The agricultural, forestry, and fishery sectors constituted 12.36% of the economic structure. In 2019, labor productivity reached an annual average income of 4,159 USD per employee (GSO, 2017a). However, the average income varies between regions and provinces; for example, the central highlands had a per-employee income of 3,223.1 USD, while the Southeast had a per-employee income of 5,596.4 USD (GSO, 2017a).

After rice and corn, cassava is the third most crucial staple crop in Vietnam's agricultural sectors. In addition to rubber trees, coffee, tea, and cashew nuts, cassava is classified as an industrial crop, and it is the third most important export crop. According to Kim et al. (2000), cassava plays an

important socioeconomic role. Furthermore, it generates employment opportunities in rural areas: in the north, this crop is used as food and feed for livestock, whereas in the south, it is a raw material for small-scale starch processing factories. This crop is grown on 513,000 hectares in 40 out of 63 provinces, with an annual production of 9.85 million tons (GSO, 2018a). In recent years, there has been an increase in the quantity of cassava production in Vietnam. Vietnam ranks ninth in the world in terms of cassava production, accounting for 3.5% of the world's old total cassava production (FAO, 2019). Statistical results from GSO (2018b) revealed that 7.42 million tons of cassava (75.3%) served domestic processing factories, while other 2.43 million tons (24.7%) were exported mainly to China (88.1%) and other countries, such as Korea (2.7%), Malaysia (1.6%), and the Philippines (1.5%).

Therefore, influenced by processing industries that use cassava starch and export demand, the price of cassava roots has fluctuated over the years. For example, in November 2012, the Prime Minister of Vietnam issued a decree mandating that all organizations and individuals producing, mixing, and trading petrol in Vietnam for use in conventional vehicle engines must use a biofuel known as E5 gasoline. Specifically, 95% RON 92 gasoline is blended with 5% bioethanol to produce E5 gasoline. The price of cassava roots has increased because bioethanol is made mainly from cassava starch (Nguyen et al., 2017). In January 2017, however, when the National Petroleum Group began selling RON 95 gasoline, the market share of E5 gasoline decreased significantly, resulting in a decline in the alcohol production industry. Moreover, compared with 2017, the amount of exported cassava decreased by 37.7% in 2018 (GSO, 2017b; GSO, 2018b).

Small-scale cassava producers, who play an essential role in the cassava sector in Vietnam, are highly susceptible to volatile cassava prices. Therefore, to earn a stable income, they might have income might rely on something other than cassava production. Previous studies suggested that farmers in rural areas tend to cultivate multiple crops, raise livestock and poultry in their spare time, and work as hired labor (Duong and Izumida, 2002; Minot et al., 2006; Nguyen et al., 2013; Hoang et al., 2014; Nguyen, 2017; Nguyen et al., 2019). Moreover, some farmers profit from specific crops, such as tea (Saigenji and Zeller, 2009). However, the income diversity of small-scale cassava producers in Vietnam needs to be studied. Therefore, it is necessary to discuss their income status to sustain and develop the cassava sector and increase cassava producers' income in Vietnam.

OBJECTIVE

This study discusses how small-scale cassava producers stabilize their household income in Vietnam.

METHODOLOGY

From April to December 2017, we randomly interviewed 182 cassava producers in the Xuan Loc district of Dong Nai province (60 producers), Tan Chau district of Tay Ninh province (61 producers), and Dak Po and Krong Pa districts of Gia Lai province (61 producers), regarding the 2016-2017 cassava production cycle. These three provinces occupy 26% of the total land used for cassava cultivation and produce 34% of total cassava production in Vietnam (Fig. 1) (GSO, 2018a).

The questionnaire was designed to understand farmers' management capacity including age, education, farming experience, and labor. Moreover, to analyze all income sources of cassava producers included in the study, four main income sectors, including agriculture income, non-farm income, pension, and remittance were generated in the questionnaire. In each sector, in the context of activities that generated income (plus or minus), producers were requested to clarify their respective contribution percentages. Microsoft Excel and R version 4.1.2 were used to analyze the data using descriptive and correlation statistics.

RESULTS AND DISCUSSION

Cassava Producers' Profile and Annual Income

In this study, 182 cassava producers, with an average age of 48.6 years and a gender ratio of 14.3% and 85.7% female and male, respectively, were interviewed. The interviewees' education levels were as follows: 14.3% no school, 42.9% elementary, 27.5% secondary school, 12.1% high school, and 3.3% bachelor. Their cultivation experiences were 23.8 years and 11.4 years for cassava production. Averagely, each family comprised 4.5 members, two of whom were the primary laborers for cassava production. Of the cassava farmers, 60.4% and 39.6% produced cassava full-time and part-time, respectively. Each cassava producer utilized 2.9 ha of land for a total of 5.1 ha of cultivation land.

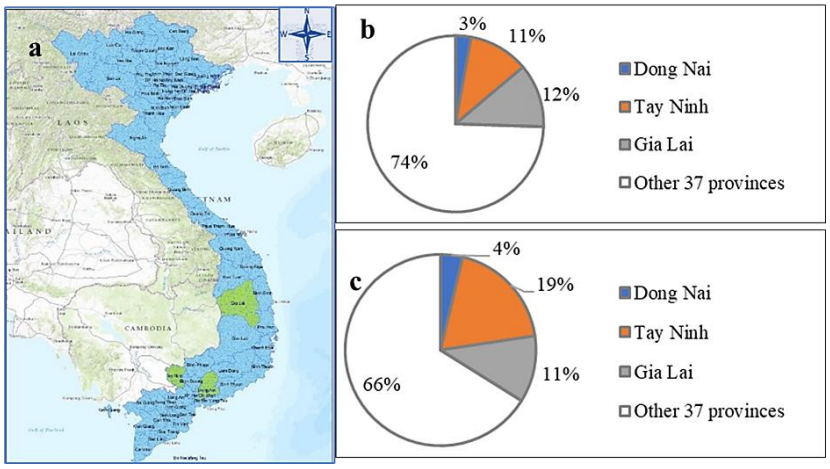

Fig. 1 Location of study sites, land use and production of cassava cultivation
(a) study site (light green); (b) land use for cassava cultivation (total: 596,000 ha); (c) cassava production (total 10,309,700 tons), (made from GSO (2019))

As shown in Table 1, the income sources of cassava producers were categorized into four sectors. This diversity is consistent with Minot et al. (2006) and Nguyen et al. (2017) study, in the sense that rural farmers maintain their income by relying on a variety of sources, including subsistence production of staple crops, commercial production of a broader range of agricultural commodities, and non-farm activities. The annual average total income of each household was $7,071.3. The average income per employee was $3,535.7 because each household had two main laborers. This was 36.8% less than the average income of Vietnamese employees according to a government declaration (GSO, 2017a).

Two primary income sources of cassava producers were agriculture at $3,648.4 (51.6%) and non-farm at $3,383.2 (47.8%). An insignificant income was derived from remittances at $25.0 (0.4%) and pension at $14.7 (0.2%). Haggblade et al. (2010) found that the non-farm sector accounted for 51% of the income of farmers in rural areas of Asian developing countries, similar to cassava producers in Vietnam. This comparison demonstrates that agricultural income is essential for cassava producers in Vietnam.

Table 1 Sharing income ($ per year) from a different source of cassava producers (N=182)

Sectors	Average	%	SD
Total income	7,071.3	100.0	10,717.17
Agriculture	3,648.4	51.6	9,472.74
Non-farm	3,383.2	47.8	5,078.94
Remittance	25.0	0.4	336.93
Pension	14.7	0.2	139.73

Hire Labor and Agriculture Income Sources of Cassava Producers

According to Kim et al. (2015), cassava is a source of income for poor farmers as it can be easily cultivated, adapted to poor soil, and has low investment costs. Cassava producers in this study

generally cultivated cassava in areas with poor soil. Other crops, such as industrial and staple crops, were grown in better soil areas. We identified eight different jobs in this study, as shown in Fig. 2. Cultivation (hired by other farmers for planting or harvesting products and so on) and work at local factories and companies were the three most attractive employments of cassava producers, sharing a total of 89.3%. Moreover, cassava producers joined the community government, soldiers, policemen, teachers, and nurses.

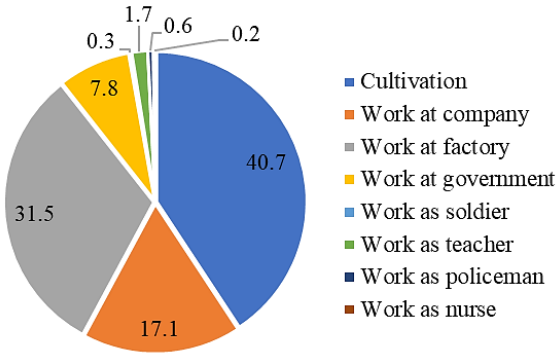

Fig. 2 Sharing employments (%) in hire labor activity of cassava producers (N = 182)

Table 2 shows that cassava cultivation accounted for 23.6% of agricultural income, with an annual average of $859.8. In contrast, income from industrial crops accounted for 76.7%, with an annual average of $2,797.1, while agro-processing products, stable crops, and vegetable and fruit crops contributed an insignificant amount of income in the agricultural sector. Concurrently, income from animal husbandry was negative $131.6 (-3.6%) annually.

Table 2 Income components of the agricultural sector ($ per year) (N = 182)

Income sources	Average	%	SD
Industrial crops	2,797.1	76.7	7,954.64
Cassava	859.8	23.6	2,617.84
Agro-processing products	49.5	1.4	440.55
Staple crops	48.7	1.3	2,339.03
Vegetables and fruits	25.1	0.7	937.15
Animal husbandry	-131.6	-3.6	1,683.22

Farmers from various rural areas rely on other main crops for their income in the agricultural sector. For example, according to Nguyen et al. (2013), rice, soya bean, and sweet potato are the main income crops for farmers in Cam My commune, Ha Tinh Province. Industrial crops, such as rubber trees (60.6%), sugarcane (21.7%), cashews (8.7.0%), tobacco (6.4%), and acacia (5.5%) are the main source of income for cassava producers in the agricultural sector (Fig. 3A). In contrast, black pepper resulted in a slightly negative income ($-9.0 per year) for cassava producers.

According to GSO (2018), areas where rubber trees, sugarcane, and cashews were planted in Vietnam were 969,700 ha, 281,000 ha, and 299,900 ha, respectively, with Dong Nai, Tay Ninh, and Gia Lai serving as the three main production areas for these crops. In this study, the cassava producers that planted rubber trees, sugarcane, cashew, tobacco, and acacia were 25 (with an average farm of 3.2 ha), 21 (with an average area of 3.9 ha), 44 (with an average farm of 1.9 ha), 9 (with an average area of 1.2 ha), and 8 (with an average farm of 3.5 ha), respectively. In addition, when cassava producers cultivated more than one industrial crop, we discovered that seven cassava producers grew rubber trees and sugarcane, six cultivated cashew and acacia, one cultivated cashew and tobacco, and another cultivated rubber trees, cashew, and acacia.

In vegetable and fruit crop cultivation (Fig. 3B), income sources were from banana (39.7%), watermelon (29.8%), dragon fruit (24.0%), and mango fruits (9.4%). Similarly, in staple crop cultivation (Fig. 3C), corn (60.7%), rice (28.2%), and bean (11.2%) were the income sources.

In animal husbandry activities, cassava producers' rear cows, pigs, goats, deer, chickens, ducks, and squabs. The negative income sources were mainly derived from rearing cattle ($-163.6 annually) and pigs ($-20 annually). The major cause of cassava production was cattle and pig deaths caused by epidemic diseases. A study by Chu et al. (2019) revealed a similar situation when animal husbandry epidemic diseases caused a lack of 47.6% of farmers in the Da River basin.

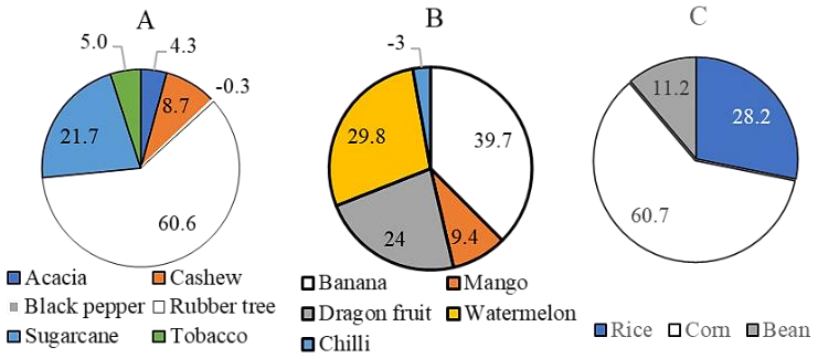

Fig. 3 Sharing income (%) in crop cultivation of cassava producers (N = 182)

Non-farm Income Sources of Cassava Producers

Non-farm activities vary from continent to country. Haggblade et al. (2010) grouped diverse rural non-farm activities as follows: mining and natural resources, manufacturing, construction, utilities, commerce, and services. Non-farm income sources of cassava producers were grouped into nine categories, as described in Section 4. The data indicates the positive and negative income derived from different activities. Hired labor activity comprised the main income source for non-farms. This activity contributed up to 81.5% ($2,757.2 annually). In this sector, middleman activity, specializing in cassava roots and stems, was the second source, gaining 10.9% ($368.6 annually). Grocery was third, at 5.83% ($195.8 yearly). A small amount was shared for the activities, including transport by a motor (1.0%), preparing motors or cars (0.8%), cashew nut businesses (0.6%), transportation by car (0.5%), and selling feed for the animal (0.1%).

Generally, cassava producers obtain a good revenue for their commercial activities. However, food booth activity resulted in a -1.3% ($-42.7 per year). This result may explain why farmers produced and sold food to inhabitants and fed their households during activities at food booths.

Table 3 Sharing annual income ($) in the non-farm sector of cassava producers (N = 182)

Income sources	Average	%	SD
Hired labor	2,757.2	81.5	3,114.14
Middleman	368.6	10.9	4,094.96
Grocery	195.8	5.8	1,147.45
Transport by motor	35.0	1.0	332.62
Repair motors or cars	27.1	0.8	271.38
Cashew nuts business	21.0	0.6	283.02
Transport by car	18.2	0.5	245.96
Selling feed for animal	3.0	0.1	40.43
Food booth	-42.7	-1.3	443.95

Correlation between Income and Total Land Area and Cassava Land Area

Analysis results indicated a correlation between total income and land use for crop production (Fig. 4A) and land use for cassava production (Fig. 4B), with the correlation coefficients (r) being 0.37 and 0.41, respectively. However, we observe that few farmers are pulling the correlation to become positive liners. The results suggest that cassava producers with more agricultural and cassava land will have more income. This finding is per the study of Minot et al. (2006), who found that expanding

the areas of cultivation is one of the various methods to improve farmers' income. A study of Nguyen et al. (2017) showed that ethnic minorities in the Northern Mountains of Vietnam could increase 15% income per capita when they increase 1,000 m^2 crop land.

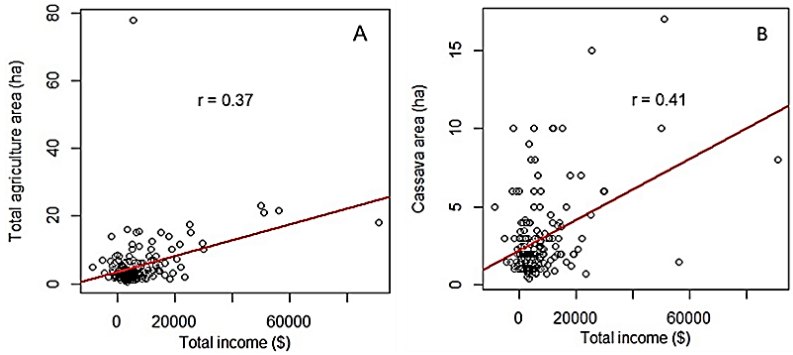

Fig. 4 Correlations between total income and total agricultural area (A) or cassava cultivated area (B) (N = 182)

Encounter Problems in Cassava Production

Other than income from cassava, we observed that cassava farmers diversified their sources of income. This section discusses the issues cassava farmers face and the possible reasons why cassava producers need to rely on more than cassava production as their primary income source. Cassava production in Vietnam has encountered various biotic and abiotic stressors. Moreover, other issues related to varieties, changing root prices, and cultivation technologies have also challenged producers. This study summarizes 11 problems in cassava production, as shown in Fig. 5. Up to 87.9% of cassava producers encountered low prices for tuber selling. Half of the cassava producers had issues with pests and diseases, and nearly one-third had problems with adverse weather during cassava farming. High-cost input and seedling die had caused trouble for approximately 10% of cassava producers. In addition, other issues, including low yield and technology, difficulty finding labor, high labor cost, counterfeit fertilizer and pesticides, and poor transportation, also affected a few cassava producers.

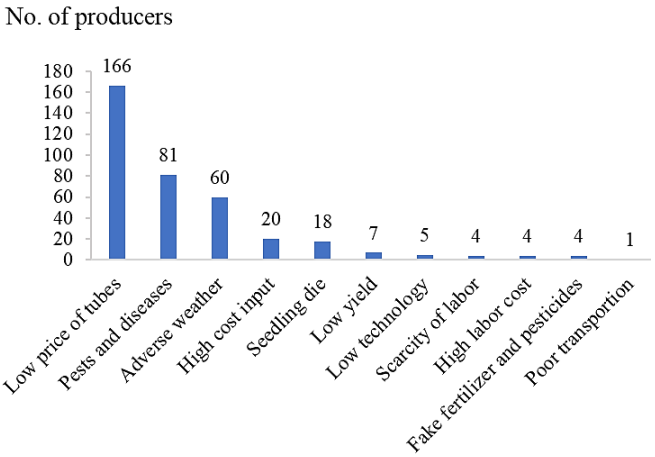

Fig. 5 Encounter problems in cassava production (N=182)

CONCLUSION

This study investigates the household income diversity of small-scale cassava producers in Vietnam. We utilized a sample of 182 cassava producers cultivating cassava fields of 2.9 ha on average, with 11.4 years of experience in cassava production in Dong Nay, Tay Ninh, and Gia Lai provinces.

The results showed that, on average and yearly, total household income was $7,071.29, of which $3,648.41 (51.59%) was from agricultural and $3,422.88 (48.41%) from non-farm sources. The average income from cassava production was $859.81, which accounted for 12.16% of the total household income and 23.57% of agricultural income. The various agricultural income sources included seven types of crops, six types of vegetables and fruits, seven types of animal husbandry operations, and three types of agro-processing businesses. Further, they engaged in eight kinds of off-farming work and were hired as laborers; this income accounted for a significant portion of the total household income. We also observed problems encountered in cassava production, which explains why cassava farmers cannot only produce cassava. Due to fluctuations in tuber prices, pests and diseases, and adverse weather, cassava producers in Vietnam diversify their income sources. They do not overly rely on cassava and stabilize their household income.

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