# Impact of Contract Farming on Farmers' Income in the Food Value Chain: A Theoretical Analysis and Empirical Study in Vietnam

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**Abstract:** This study empirically analyzes the influence of contract farming on income and farming difficulties in Vietnam by using the econometric models and theoretically identifying the affecting mechanism of contract farming on income, sustainability, and welfare by using the qualitative method. The empirical results show that contract farming insignificantly impacts farms' income while it can facilitate farming activities and decrease difficulties. The factors of education—head, gender of head, type of crop, and technology may affect farmers' income. The impacting mechanism of contract farming on income, sustainability, and welfare is theoretically proposed as follows: Contract farming initially impacts the intermediate factors such as cooperative, market access, knowledge and skill, product quality, technology, and support. These factors then affect capacity, linkage, quality, and certification which can enhance farmers' competitiveness. In the long term, stronger competitiveness, higher price, increasing productivity, and lower cost may significantly improve income, sustainability, and welfare. In general, contract farming may have positive impacts on income, sustainability, and welfare in the medium term and long term. In the short term, the result is not significant due to the similar or lower price comparing with the spot market price, growing production cost, decreasing productivity, and weak contract performance. The findings may help policymakers decide how to expand contract farming and its benefits. Economic scholars can test and compare both quantitative and qualitative findings in other contexts.

**Keywords:** agriculture; contract farming; income; sustainability; theoretical analysis; Vietnam

## 1. Introduction

Recently, the main concerns of agricultural economists and policymakers are poverty reduction, farmers' income and welfare increase, fairness improvement, and sustainable development in the global food value chain. Moreover, food consumption markets growingly come to a high-value product, food diversity, quality and safety standards, stable supply, and sustainable certifications under the conditions of income growth, globalization, health concerns, lower trade barriers, and technology development [1–3]. The social concerns and food market changes may enhance horizontal and vertical linkages between the actors in the agri-food value chain. Contract farming is an intermediary form of vertical coordination in agricultural production. It has been an increasingly popular institutional measure to ensure the quality and quantity of inputs for processors, exporters, distributors, and supermarkets [4,5]. Especially, contract farming would be more likely to emerge when market failure appears while uncertainty and commodity specificity are high, such as in the trade of products that are perishable and difficult to store and transport [6,7].

The benefit of contract farming has been a topic of interest and controversy since the 1970s, especially in developing and transition countries [2,8]. Contract farming is broadly perceived as a key tool of improving social welfare, enhancing global food security, improving technology and food quality, and increasing employment and productivity [4,9–11]. The tool helps farmers overcome production constraints of finance and insurance, poor

access to good inputs, and the lack of technical and managerial capacity [5,12]. Besides, contract farming is an important component for risk management, the macro balance of the economy, upgrading producers' livelihoods, and overcoming market failures [6,9,13,14].

However, contract farming is often criticized as being a tool for enterprises to exploit unequal power relationships with farmers and extract rents [15]. Large agribusiness firms can use contracts to take advantage of cheap labor and transfer risk to farmers. Small farmers may be ignored since firms prefer to work with big farmers, thus exacerbating inequality for small and weak farmers in rural areas [2,16,17]. Moreover, a contract with the provision of input and a fixed price may be perceived as a disadvantage of contract farming that restricts farmers to accessing better sources of seed, fertilizer, credit, and technical assistance as well as selling in spot markets to obtain a higher price and income.

Since Doi Moi (Renovation) in 1986, Vietnam has become a socialist-oriented market economy and achieved high social and economic growth. Vietnam's agricultural sector has shifted from the collective and centrally planned system to the private and market-oriented system since the event. The sector has significantly developed and contributed to Vietnam's economic and social development regarding poverty reduction, the gross domestic product, total employment, and export value. However, the agricultural sector confronts both internal disadvantages such as small-scale and dispersed production, information and power asymmetry, low productivity and value-added, and unstable price and external challenges such as increasing competition, rising consumer requirements, soil degradation, and climate change [18].

This study initially tries to respond to the research questions whether and how can contract farming impact farmers' income and farming difficulties in Vietnam by using the econometric models? Next, the article explores the justification for the empirical findings and identifies the mechanism of how contract farming affects income, sustainability, and welfare by using a qualitative framework. The findings may have both a practical and academic contribution. Policymakers can utilize the results to decide how to expand contract farming and its benefit. Scholars may test and compare the findings in other contexts. The rest of the paper is structured as follows: Section 2 explains the Materials and Methods; Section 3 presents the Results and Discussion; Section 4 shows the Conclusion.

## 2. Materials and Methods

### 2.1. Materials and Literature Review

2.1.1. Agricultural Sector and Linkage Policy in Vietnam

Since the Renovation in 1986 (and also in 1991), Vietnam's agricultural sector has shifted from the collective and centrally planned system to the private and market-oriented system. In recent decades, the agricultural sector has significantly contributed to Vietnam's economic and social development over the progress of industrialization and globalization as follows: The agricultural sector accounts for 14.57% of Vietnam's Gross Domestic Product in 2018. The sector engages 39.8% of the total employment in 2018. It contributes 12.11% to the total export in 2017. The population in the rural area accounts for 64.08% of the total population in 2018 (Figure 1). These proportions are relatively high in comparison with the world average levels. However, the general contribution of the agricultural sector seems to reduce over time due to the considerable development of the manufacturing industry and service sector [18].
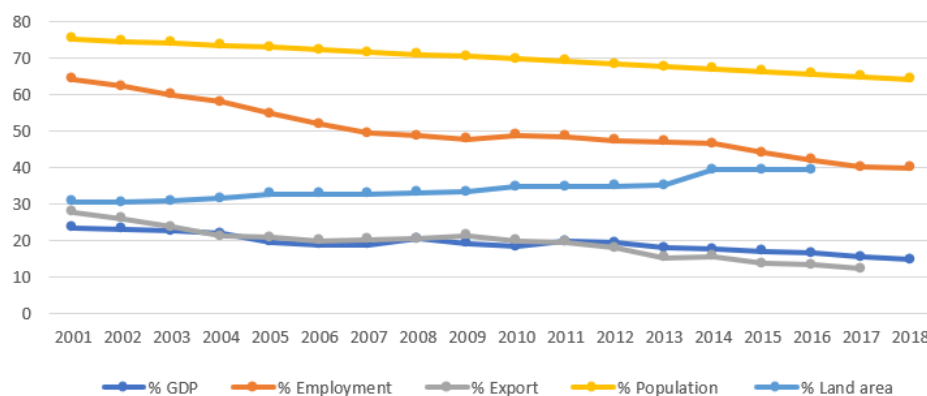
**Figure 1.** The proportions of the agricultural sector in the national economy. Sources: The author's own calculation from [19–21].

Since the Renovation, Vietnam's government has released various policies on linking farmers to the markets for alleviating poverty, increasing farmers' income, reducing information and power asymmetry, and enhancing agricultural development. The global value chain, agricultural cooperative, and contract farming are the main measures and solutions in the progress. The measures are usually combined with various supports. The report of Dang et al. [22] shows that, since the introduction of the Cooperative Act 2003, there have been at least 143 policies and legal documents (13 laws, 35 decrees, 42 decisions, 47 circulars, and 6 directives) on collective economy enacted in Vietnam to promote farmers' cooperation and other types of coordination system in agricultural production. However, the understanding and awareness of these concepts are still not sufficient. The measures and policies are limited with various overlap, contradiction, inefficient practice, and lack of consistency and innovation [22,23].

### 2.1.2. Definitions of Contract Farming

There are various definitions of contract farming in agricultural economics and practice. The concept is initially defined by Roy [24] as "those contractual arrangements between farmers and other firms, whether oral or written, specifying one or more conditions of production and/or marketing of an agricultural product". Contract farming is widely documented in the global value chains for high-value products and it is likely to appear when uncertainty is high, such as in the trade of products that are perishable, difficult to store and transport, and heterogeneous quality [7]. Thus, contract farming should be universally defined as an intermediary form of vertical coordination between growers and contractors in food value chains that can (i) directly shape production decisions through contractually specifying market obligations such as price, value, volume, quality, and time; (ii) provide specific inputs; (iii) exercise some control at the point of production in response to consumers' high and growing demand for product quality and safety, and (iv) eliminate the farms' production constraints from market imperfections [5,17]. In practice, contract farming should be defined as an agreement between farmers (sellers) and firms (buyers) in advance on the terms and conditions for the growing and marketing of agri-food products. These conditions specify price, quantity, quality, delivery time, transport, and inputs such as seeds, pesticides, fertilizers, and technical advice provided by the firm [25].

### 2.1.3. Why Contract Farming?

At the macro level, contract farming may result in diverse advantages such as increasing the economy of scale; overcoming market failures; decreasing public investment, transaction costs, and income risks; and improving access to credit and insurance [26–29]. Evidence for the positive impact is early provided by comparing farmers with and without contract farming [16,30]. However, the effect estimate may be biased as it is not clear whether richer farmers are more likely to participate in contract farming [31]. At the farm

level, recent empirical studies have estimated the causal effect of contract farming on farmers' agricultural productions and welfare. The results show that farmers obtain various benefits from participation in contract farming such as reducing production costs; increasing yields, prices, profits, and income; improving product quality; expanding production and business; developing farm technologies and management practices; enhancing access to information sources and market, and linking small farmers to the global and advanced supply chains [32–37]. Table 1 reviews empirical studies on assessing the influence of contract farming on farmers' income in the food value chains.

**Table 1.** Literature review in the impact of contract farming on income.

| Author | Country | Product | Sample | Method | Effect |
|---|---|---|---|---|---|
| Warning and Key (2002) [15] | Senegal | Peanuts | 26 | Heckman | 207,007 XOF |
| Winters et al. (2005) [38] | Indonesia | Seed Corn | 289 | 2SLS | 5683.56 XOF |
| | Indonesia | Seed Corn | 300 | 2SLS | 3,540,400 IDR |
| Simmons et al. (2005) [39] | Indonesia | Seed Rice | 300 | OLS | No effect |
| | Indonesia | Broiler Chickens | 200 | OLS | 13,500,000 IDR |
| Miyata et al. (2009) [2] | China | Apples, Green Onions | 162 | Heckman | 1276 CNY |
| | China | Apples, Green Onions | 162 | OLS | 1476 CNY |
| Ramaswami et al. (2006) [40] | India | Broiler Chickens | 285 | 2SLS | 1.1 INR |
| Maertens and Swinnen (2012) [41] | Senegal | Vegetables | 300 | PSM | 3,300,000 XOF |
| Jones and Gibbon (2011) [42] | Uganda | Cocoa | 222 | 2SLS | 101% |
| Rao and Qaim (2011) [43] | Kenya | Vegetables | 402 | ESR | 35,626 KES |
| Escobal and Cavero (2012) [44] | Peru | Potato | 360 | ESR | 1343 USD |
| Saigenji (2012) [45] | Vietnam | Tea | 124 | PSM | 895 VND |
| Narayanan (2014) [46] | India | Gherkins, Papaya, Marigold, Broiler Chickens | 474 | ESR | 21%, 47%, 50%, 123% |
| Trifkovic (2014) [47] | Vietnam | Catfish | 191 | 2SLS | 112% |
| Wainaina et al. (2014) [48] | Kenya | Poultry | 180 | PSM | 7–8 KES |
| Wang et al. (2014a) [49] | Vietnam | Vegetables | 137 | PSM | 17,000,000 VND |
| Girma and Gardebroek (2015) [34] | Ethiopia | Honey | 195 | 2SLS | 307 USD |
| | Ethiopia | Honey | 195 | PSM | 404–411 USD |
| Sokchea and Culas (2015) [50] | Cambodia | Rice | 75 | Heckman | 481 USD |
| Ma and Abdulai (2016) [51] | China | Apples | 422 | ESR | 1.23 CNY/mu |
| Li et al. (2016) [52] | China | Vegetables | 416 | PSM | No effect |
| Maertens and Velde (2017) [33] | Benin | Rice | 396 | PSM | 175 USD |
| Soullier and Moustier (2018) [6] | Senegal | Rice marketing contract | 470 | 2SLS | No effect |
| | | Rice production contract | | 2SLS | 29.68 XOF |
| | | Rice production contract | | PSM | 26.51 XOF |

Source: The author's own literature review.

In addition, contract farming brings in various social and economic influences such as reducing the hungry season and poverty, improving food security, and increasing productivity spillovers on other crops [5,10,37,53]. Most studies show the significant impact of contract farming on income while some studies prove the insignificant impact of contract farming on income [6,39,52]. However, there may be a publication bias since insignificant results are usually unlikely to be published [9]). CFRC [25] remarkably summarizes that contract farming can link smallholder farmers to markets, decrease the uncertainty and unpredictability in agricultural production, minimize risks in fluctuating prices or natural disasters, and notably increase yields and profits.

For firms, contract farming is a basic strategy to minimize transaction costs, ensure stable inputs, and reduce production costs [17,54]. Moreover, contract farming can assist firms to achieve political acceptability, overcome land constraints, obtain producer's reliability, share farming risks, ensure the consistency of quality and quantity, promote farm inputs, reduce input and labor costs, enhance access to credit and financial incentives, and expand business [54,55].

2.1.4. Why Not Contract Farming?

Though contract farming results in various benefits, it has limitations and there is, in fact, a high rate of failure for contract farming schemes [7]. Contract farming is often criticized as being a tool for firms to exploit unequal power relationships with farmers and extract rents [15]. Specifically, large enterprises may use contracts to take advantage of cheap labor and transfer risks to farmers. Another concern is that smallholders may be marginalized because firms prefer to work with medium-scale and large-scale farmers, thus exacerbating rural inequality [2,17]. Though farmers have preferences for contract farming, they have remaining preferences for various attributes of traditional spot markets such as the lack of product gradations, cash payments, lack of delivery schedules, possibility to get a higher price, ability to sell at the farm gate, and ability to sell individually [53]. Other reasons for the failure of contract farming are disagreements between farmers and firms over quality standards and delays in delivery and payment, farm's loss of autonomy and decision, imbalance of power and risk sharing, difficulties and unfairness of contractual obligations, intra-household tensions over allocation of new revenues, and increasing rural inequality [16,17,56]. Technological barriers and incentive problems are partially responsible for that failure [57].

Moreover, contract farming universally maximizes land-use intensity and leads to higher levels of pollution. It may result in the decrease of essential food production and the increase of food security problems as the result of the concentration on high-profit and contract crops [58,59]. In general, the disadvantages of contract farming for farmers can be summarized as follows: loss of flexibility, possible late payment, unequal bargaining power, decrease in real prices, loss of premium for unsuitable technology and crop incompatibility, the manipulation of quotas and quality specifications, corruption, domination by monopolies, indebtedness, and over reliance and vulnerability [25,54,55].

In summary, the literature on contract farming shows that contract farming may result in considerable advantages for farmers while it may also cause disadvantages to the actors. Many empirical studies indicate the positive impact of contract farming on income while some articles show the insignificant influence. Various challenges can impede contract farming schemes and make them fail. There is a dearth of studies that identify the causes of those insignificant results and practical failures as well as propose an impacting mechanism of contract farming on income, sustainability, and welfare.

*2.2. Methods and Data*

This study employs both quantitative and qualitative methods to achieve the research objectives. First, econometric models are used to investigate the impact of contract farming on income and farming difficulties. Next, a qualitative framework is utilized to provide justifications for the empirical results and identify the impacting mechanism of contract farming on income, sustainability, and welfare.

2.2.1. Empirical Model

There are various models to assess the impact of contract farming and other factors on income and farming activities. A linear model is used if the dummy variable for contract farming is exogenous [2,39]. The two-stage least square (2SLS), also called the instrumental variable method, is used to avoid the simultaneity bias which probably stems from the joint determination of income and contract participation [6,34,47,60]. Heckman selection-correction model is used to address the omitted variable bias originating from a specific sample selection model [15,50]. Propensity score matching (PSM) is employed to compare the performance of the contract and non-contract farmers by accounting for observable factors when (i) there is no instrument variable associated with contract participation and that instrument variable is independent of income; (ii) the data does not fit with the strict condition of the distribution function of the joint error term associated with participation and income equation in Heckman selection-correction model [33,34]. The endogenous

switching regression (ESR) model, which accounts for both observable and unobservable factors, is used if at least one of the selectivity correction terms is significant [44,46,51].

This study examines the impact of contract farming and other variables on farmers' income and farming difficulties. There are two outcome variables in this research: income per hectare and farming difficulties. Previous studies use various indicators for income variable, including the total household income consisting of net income from agricultural production, livestock rearing, off-farm employment, non-farm business, and transfers [1,33,49]; household agricultural income [34,42,50]; net income per unit area [46,51]; net income per unit yield [40,48]; household income per capita [1,43]; and daily household expenditure per capita [45,47]. In this study, the income indicator is calculated by the net profit plus the home labor and manure cost (i.e., these inputs bring income to farmers) per hectare. This variable is continuous thus the linear model is used to test the impact of contract farming on income. The income equation is specified as follows:

$$Y_i = \alpha + \delta C_i + \beta X_i + \varepsilon_i \tag{1}$$

where $Y_i$ is the agricultural income per hectare of farmer $i$; $C_i$ is dummy variable that takes the value 1 if farmer $i$ participates in a contract and takes the value 0 otherwise; $X_i$ is the vector of control variables; $\varepsilon_i$ is an error term; $\alpha$, $\delta$ and $\beta$ are parameters to be estimated.

The study conducts Hausman's test for endogeneity. The result shows that contract dummy is exogenous, which illustrates that firms hold positions of considerable power in contract selection and, given the strong interest in contracts from smallholders, had plenty of "would be" contractors to choose from [39]. Thus, OLS is used to estimate parameters.

The second variable is farmers' assessment or perception of farming difficulties in capital, technology, input, land degradation, and market. Likert scale is employed for these variables so that the ordered probit model is used to investigate the impact of contract farming on the evaluation of difficulties. In the ordered probit model, the functions are defined as follows:

$$D_i^* = \delta C_i + \beta X_i + \varepsilon_i \tag{2}$$

where $D_i^*$ is the exact but unobserved dependent variable of the assessments of farming difficulties. Thus, we can only observe the categories of response:

$$D = \begin{cases} 0 \ if \ D_i^* < \mu_1 \\ 1 \ if \ \mu_1 < D_i^* < \mu_2 \\ 2 \ if \ \mu_2 < D_i^* < \mu_3 \\ 3 \ if \ \mu_3 < D_i^* < \mu_4 \\ 4 \ if \ \mu_4 < D_i^* < \mu_5 \\ 5 \ if \ D_i^* > \mu_5 \end{cases} \tag{3}$$

The parameters $\mu_j$, $j = 1, \ldots, 5$, are known as cut points. Let $P_i(D)$ be the probability that the farmer $i$'s response is $D$. This probability is as follows:

$$P_i(D) = P(\mu_{j-1} < D_i^* < \mu_j) = \Phi(\mu_j - \delta C_i - \beta X_i) - \Phi(\mu_{j-1} - \delta C_i - \beta X_i) \tag{4}$$

where $\Phi$ is the standard normal cumulative distribution function.

### 2.2.2. Qualitative Analysis

The theoretical analysis is fulfilled by employing a qualitative framework which is developed based on exploratory interviews and a grounded-theory process. Exploratory interviews include in-depth interviews, participant observations, and a focus group. The grounded-theory process is modified from the approaches of [61–63] in accordance with protocols and the evaluative criteria to obtain a methodological fit and rigor [64]. The model consists of five core stages and different techniques such as in-depth interviews, participant observations, a focus group, and affirming interviews. Data coding and analysis may

include four main steps such as codes, concepts, categories, and theories. The qualitative research framework is presented in Figure 2:
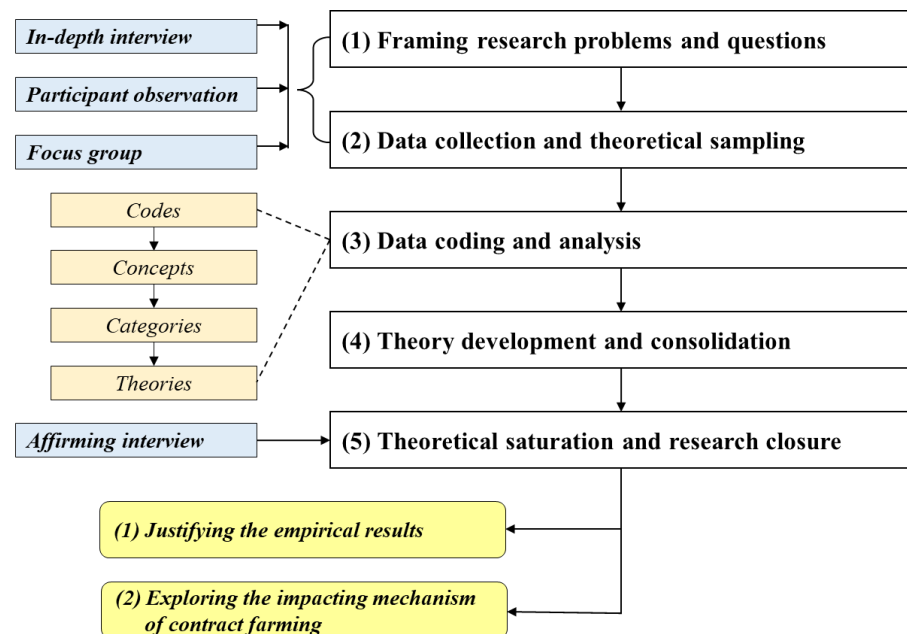


**Figure 2.** The framework of the theoretical analysis.

2.2.3. Data Collection

First, the primary farm-household data was collected from a survey conducted in the Mekong River Delta in 2018–2019 by the convenience and purposive sampling method and structured questionnaires. The sample participants are 460 farmers, including 161 rice farmers, 116 Daxanh pomelo fruit farmers, 115 coconut farmers, and 68 vegetable farmers. The structured questionnaires are built, piloted, and used in this survey. Farmers are asked to provide detailed information on four parts: (1) farm-household and production characteristics—seller side: education, age, gender and farming experience, participation in farm groups or cooperatives, number of family members, number of main laborers, farm's location, main crop and size, soil and water quality, turnovers, input costs, quality certification; (2) contract, market and firm factors—buyer side: contract form, payment method, sale place, contract terms, the purpose of participating in contract, price information sources, type of buyer, market estimation, and preferences of supports; (3) supporting policy and programs—policy aspect: receiving supports from the government, association, and (4) farmers' perception or assessment of their farming difficulties.

Second, the primary data for the qualitative analysis was collected in the Mekong River Delta in 2019 by exploratory interviews, including in-depth interviews, participant observations, and a focus group. The 28 respondents for in-depth interviews and the six interviewees for a focus group are agricultural cooperative leaders, farm owners, agribusiness firm leaders, local government officers, and experts. The research team participates in and observes two meetings between cooperatives, farmers, firms, and government officers. The secondary data is collected from various sources such as the Vietnam GSO, ITC, and WB for descriptive analysis.

## 3. Results and Discussion

*3.1. Testing the Factors of Participation in Contract Farming*

3.1.1. Descriptive Statistics

The outcome and explanatory variables with their mean differences between farmers with and without contract farming are presented in Table 2 by using *t*-test. On average, the household head has the age of 52 years, the education of 8 years, and the farming

experience of 24 years. Most of the farmers are male with a ratio of 81%. This shows that young and highly-educated people emigrate from rural areas to cities to work in the industrial and service sectors. Farmers are mainly old and low-educated people. The average number of workers in a household is 2.8. The mean farm size is relatively small with 0.58 ha. Most of the agricultural lands are alluvial soil with 53% and gray soil with 25%. Notably, farmers face soil problems of salinity intrusion and pollution with responding ratios of 12% and 14%. Most of the farms are near a river or/and motorbike road with 52% and 36% while only 22% of farms are near a truck road. It is a disadvantage that only 13% of farmers can access credit and have previous loans. Only 20% of farmers are in agricultural cooperatives while 70% of farmers have the association membership and 91% of farmers can obtain supports from policy and programs. Another disadvantage is that only 7% of farmers achieve certifications for their products.

**Table 2.** Descriptive statistics of outcome and explanatory variables in the estimation.

| Variables | Total | No Contract | Contract | *p*-Value |
|---|---|---|---|---|
| Age of head (years) | 51.98 (10.22) | 51.93 (10.39) | 52.02 (10.10) | 0.927 |
| Education of head (years) | 8.39 (2.86) | 8.76 (2.75) | 8.07 (2.92) | 0.013 ** |
| Farming experiences of head (years) | 18.71 (11.45) | 18.46 (10.63) | 18.93 (12.14) | 0.668 |
| Gender of head (female = 1) | 0.19 (0.40) | 0.14 (0.35) | 0.24 (0.43) | 0.011 ** |
| Main laborer (number) | 2.80 (1.09) | 2.85 (1.07) | 2.75 (1.12) | 0.358 |
| Farm size (ha) | 0.58 (0.47) | 0.57 (0.45) | 0.58 (0.49) | 0.815 |
| Soil quality | | | | |
| *Alluvial (yes = 1)* | 0.53 (0.50) | 0.66 (0.48) | 0.41 (0.49) | 0.000 *** |
| *Gray (yes = 1)* | 0.25 (0.43) | 0.18 (0.38) | 0.31 (0.46) | 0.001 *** |
| *Acid sulfate (yes = 1)* | 0.13 (0.34) | 0.15 (0.36) | 0.11 (0.31) | 0.134 |
| *Salinity intrusion (yes = 1)* | 0.12 (0.33) | 0.10 (0.30) | 0.14 (0.35) | 0.228 |
| *Polluted (yes = 1)* | 0.14 (0.34) | 0.12 (0.33) | 0.15 (0.36) | 0.406 |
| Farm location, near | | | | |
| *River (yes = 1)* | 0.52 (0.50) | 0.48 (0.50) | 0.56 (0.50) | 0.095 * |
| *Truck road (yes = 1)* | 0.22 (0.41) | 0.21 (0.41) | 0.23 (0.42) | 0.592 |
| *Motorbike road (yes = 1)* | 0.36 (0.48) | 0.37 (0.49) | 0.35 (0.48) | 0.659 |
| *Land road (yes = 1)* | 0.26 (0.44) | 0.20 (0.40) | 0.32 (0.47) | 0.004 *** |
| Loans (yes = 1) | 0.13 (0.33) | 0.08 (0.28) | 0.16 (0.37) | 0.098 * |
| Technology (1000 VND/ha) | 2586 (6262) | 1710 (4124) | 3363 (7598) | 0.005 *** |
| Cooperative membership (yes = 1) | 0.20 (0.40) | 0.13 (0.34) | 0.25 (0.44) | 0.001 *** |
| Association membership (yes = 1) | 0.70 (0.46) | 0.71 (0.46) | 0.70 (0.46) | 0.786 |
| Supporting policy and program (yes = 1) | 0.91 (0.29) | 0.88 (0.33) | 0.94 (0.24) | 0.018 ** |
| Quality certificate (yes = 1) | 0.07 (0.26) | 0.01 (0.12) | 0.12 (0.33) | 0.000 *** |
| Income per hectare (1000 VND/ha) | 141883 (223,105) | 131523 (207,486) | 151087 (236,163) | 0.350 |
| Degree of farming difficulties | | | | |
| *Lack of capital* | 2.35 (1.57) | 2.26 (1.62) | 2.42 (1.54) | 0.295 |
| *Low technology* | 2.55 (1.39) | 2.43 (1.45) | 2.65 (1.34) | 0.090 * |
| *Input quality risk* | 2.42 (1.52) | 2.59 (1.64) | 2.27 (1.39) | 0.025 ** |
| *Land degradation* | 3.07 (1.59) | 3.19 (1.64) | 2.92 (1.50) | 0.068 ** |
| *Market risk* | 2.20 (1.47) | 2.35 (1.52) | 2.07 (1.43) | 0.047 ** |

Source: The author's own analysis. Note: Standard deviations in parentheses. * Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Household characteristics are significantly different in education, gender, alluvial soil, gray soil, river location, land road location, loans, and price reference. Cooperative membership, supporting policy and program, and quality certifications are the important factors of contract farming. There are considerable differences between the two groups: that farmers with contract farming have higher propositions of cooperative membership (0.25), supporting policy and program (0.94), and quality certificate (0.12) than those without contract farming (0.13, 0.88, and 0.01, respectively). There is an insignificant distinction in farmers' income per hectare between participation (131 million VND) and non-participation (151 million VND). Difficulties in technology, quality risk, land degradation, and market risk are recorded as significant differences between the two groups while lack

of capital is insignificantly different. However, the statistic results in Table 2 should not be used to make the final and complete inferences regarding the influences of contract farming and other variables on farmers' income and farming difficulties as the simple comparison of mean differences does not account for different factors and their relations in the framework [51]. The next part will present the empirical results of the linear regression model and the ordered probit model of the impact of contract farming on farmers' income and farming difficulties.

3.1.2. Impact of Contract Farming on Farmers' Income and Farming Difficulties

The study initially assesses the impact of contract farming and other factors on farmers' income and farming difficulties with the expectation that contract farming can increase farmers' income and decrease farming difficulties. However, the finding indicates that contract farming does not affect farmers' income (Table 3). Three factors impact farmers' income, namely education of the head, gender of the head, and technology. The results show that farmers with higher education and more investment in technology may obtain higher income. The results are reasonable because higher education and technology investment may increase productivity, effectiveness, and product quality while they reduce the production cost. However, the female farmers seem to produce less income for their households. The potential explanation is that, in practice, most farmers in the Mekong River Delta are usually men (in this survey, 81% of farm heads are male) who have more physical strength and working productivity. Women in this area are normally housewives. Households with female heads are small and disadvantageous. Thus, they earn less income. Pomelo and coconut crops result in higher incomes than rice farms, especially pomelo crops. The reason is that pomelo is a specialty fruit while rice is a traditional food. It is also unexpected that the influences of the important factors such as soil quality, cooperative membership, association, supporting policy and program, and quality certificate on income are not statistically significant.

The second part of the econometric analysis is to assess the impact of contract farming on farming difficulties by using the ordered probit model. The results show that contract farming may reduce farming difficulties in input and market (Table 3). This result may be justified by the nature of contract farming to supply inputs to farmers and purchase the outputs from farmers. In other words, when farmers have a contract with an agribusiness firm, they may not be worried about the input quality risk, input supply shortage, product price decrease, and product redundancy (i.e., cannot sell). However, contract farming has no impact on farming difficulties in financial capital, technology, and land degradation.

The higher education of the head can reduce the farming difficulty in technology. Interestingly, the female head of the household may solve the farming difficulty in technology. The possible reason is that the technology and technique of these crop productions are relatively simple and a woman is usually more skillful than a man. The quality certification also decreases the farming difficulty in financial capital thanks to the credit advantage when farmers apply good agricultural practices. It is unexpected that the investment in technology increases the farming difficulty in technology; cooperative membership and association increase the farming difficulty in financial capital, and supporting policy and program also increase the farming difficulty in the market.

Farm size helps reduce land degradation while it makes farmers face more difficulty in financial capital. Good quality soil may reduce farming difficulties in financial capital, market, and technology. Farm positions that are not near the truck road can increase the farm's difficulty in the market. The unexpected results are that salinity intrusion soil reduces the market difficulty and polluted soil reduces land degradation.

**Table 3.** Impact of contract farming on farmers' income and farming activities.

| | Income | Capital | Technology | Input | Land Deg. | Market |
|---|---|---|---|---|---|---|
| Contract participation | −3198 | −0.154 | 0.119 | −0.320 ** | −0.206 | −0.988 *** |
| Age of head | 616 | 0.006 | −0.006 | 0.006 | −0.003 | 0.017 |
| Education of head | 13,267 *** | −0.004 | −0.043 * | 0.025 | 0.002 | 0.015 |
| Experiences of head | 1178 | −0.001 | −011 | −0.003 | 0.002 | −0.003 |
| Gender of head | −61,146 ** | −0.243 | −0.491 *** | −0.189 | −0.117 | 0.396 |
| Main laborer | 4568 | −0.066 | 0.036 | 0.049 | 0.087 | 0.176 |
| Crop | | | | | | |
| *Coconut* | 63,868 ** | −0.311 | 0.027 | −0.297 | −0.858 *** | −9.189 |
| *Pomelo* | 346,082 *** | −0.370 | 0.257 | −0.096 | −0.165 | −9.828 |
| *Vegetable* | 51,014 | 0.613 ** | 0.430 * | 0.333 | −0.247 | −9.527 |
| Farm size | | 0.291 * | 0.173 | 0.159 | −0.071 | −0.207 |
| Soil quality | | | | | | |
| *Alluvial* | 29,076 | −0.605 ** | 0.038 | −0.047 | 0.116 | −0.644 * |
| *Gray* | 39,400 | −0.151 | 0.556 ** | 0.182 | 0.210 | −387 |
| *Acid sulfate* | −38,395 | 0.418 * | 0.202 | 0.338 | 0.472 ** | 0.603 * |
| *Salinity intrusion* | 34,533 | 0.246 | 0.256 | 0.345 | 0.323 | −1.131 *** |
| *Polluted* | −25,671 | 0.136 | 0.517 * | 0.393 | −0.572 ** | −1.380 |
| Farm position | | | | | | |
| *River* | 14,495 | 0.073 | 0.128 | 0.215 | 0.154 | 0.559 * |
| *Truck road* | 5651 | −0.006 | 0.232 | −081 | −0.015 | 0.188 |
| *Motorbike road* | 15,702 | 0.192 | −0.073 | −0.204 | 0.106 | 0.817 *** |
| *Land road* | −15,120 | 0.044 | −0.057 | −0.229 | −0.173 | 0.987 *** |
| Loans | 9345 | 0.593 *** | −0.148 | 0.242 | 0.017 | −0.336 |
| Technology | 11.520 *** | 0.000 | 0.000 * | 0.000 | 0.000 | 0.000 |
| Cooperative membership | −2788 | 0.352 * | −0.088 | −0.222 | −0.081 | 0.841 |
| Association | 7884.000 | 0.318 ** | 0.211 | 0.244 | −0.160 | −0.037 |
| Supporting policy and program | 25,324 | −0.045 | −0.044 | −099 | −0.212 | 1.550 *** |
| Quality certificate | 69,975 | −0.590 ** | 0.045 | −0.193 | −0.286 | −891 |
| *Constant* | −229,643 | | | | | |
| *Thresholds* | | | | | | |
| $\mu_0$ | | −2.209 | −2.506 | −1.369 | −2.709 | 0.426 |
| $\mu_1$ | | 0.075 | −0.605 | 0.212 | −1.559 | 2.162 |
| $\mu_2$ | | 0.563 | −0.087 | 0.880 | −0.933 | 2.725 |
| $\mu_3$ | | 1.042 | 0.762 | 1.424 | −0.457 | 3.404 |
| $\mu_4$ | | 1.505 | 1.662 | 1.952 | 0.391 | 3.788 |
| $\mu_5$ | | 3.372 | 2.779 | 3.042 | 2.578 | 0.000 |

Source: The author's own analysis. Note: * Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

### 3.2. How Contract Farming Affects Farmers' Income

The literature review indicates that contract farming can increase farmers' income whereas some empirical studies show insignificant or negative results. Wang et al. [65] review the empirical studies and find out that 75% of studies show a positive effect while 6.3% of studies indicate the negative effect. Meemken and Bellemare [66] prove that contract farming brings in higher incomes only in a few countries. There is no evidence of spillover effect at the community level while contract farming may stimulate employment. This study employs the theoretical analysis to identify the mechanism of how contract farming affects income, sustainability, and welfare as follows:

3.2.1. Impacting Mechanism and Intermediate Factors

The affecting process of contract farming on income, sustainability, and welfare should be divided into three stages: the short term, the medium term, and the long term (Figure 3). There should be two steps of the affecting mechanism of contract farming as follows: Contract farming initially affects core factors and intermediate factors in each stage. Next, the intermediate factors impact income, sustainability, and welfare.
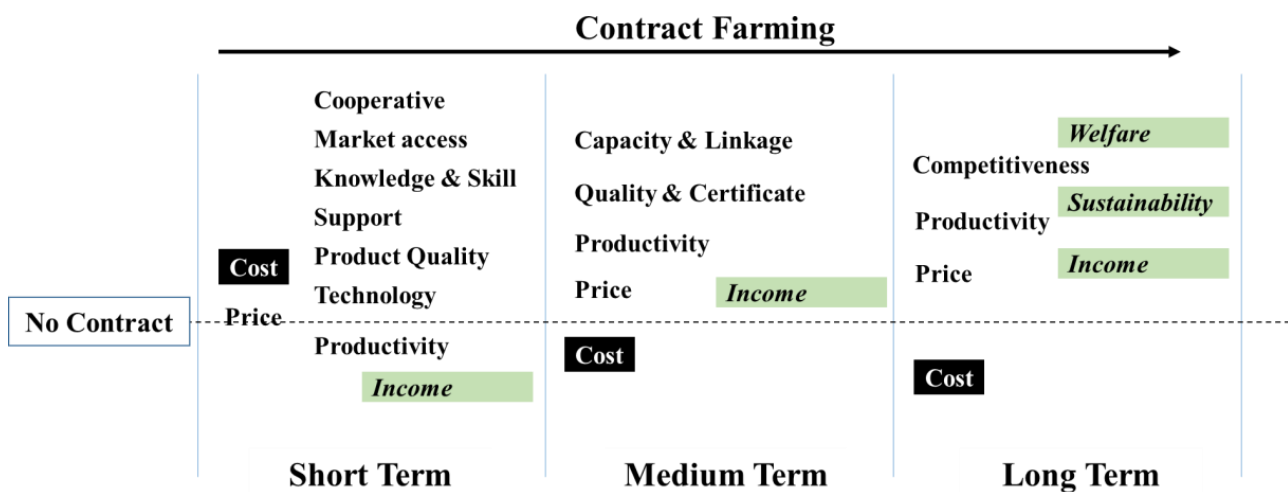
**Figure 3.** The mechanism of how contract farming affects income, sustainability, and welfare.

The short-term stage: In this stage, contract farmers may suffer the higher investment, the increasing production cost, the decreasing productivity to satisfy firms' requirements, especially higher quality standards. Whereas, the sale price in a contract cannot be surely higher than the spot market price. These may finally cause a decrease in farmers' income. However, contract farming may have a real impact on the intermediate factors such as cooperative membership, market access, knowledge and skill, product quality and safety, technology and technique, trust, and support from the government. Contract farming can facilitate farming activities and reduce farming difficulties in this period.

The medium-term stage: After stage 1, the intermediate factors affected by contract farming may assist contract farmers to obtain the higher real price in comparison with the spot market prices, the increasing farming productivity, the lower production cost, quality certifications, the higher capacity, and the linkage in the value chain. As the result, the contract farmers can achieve higher incomes. In other words, contract farming may start significantly impacting farmers' income in the medium term.

The long-term stage: After a long time with contract farming, contract farmers can have stronger competitiveness based on the higher capacity (knowledge, skill, experience, technology, technique, trust, and market information), strong linkage to the value chain, higher product quality, and certifications; reduce production costs; increase productivity, and obtain higher sale prices. These intermediate factors also result in more sustainable and fairer agricultural production and practice. These finally demonstrate that contract farming may significantly affect income, sustainability, and welfare in the long term.

3.2.2. Why Contract Farming Insignificantly Impacts Farmers' Income in the Short Term

The reasons why contract farming insignificantly impacts farmers' income in the short term, as the empirical findings in Vietnam show, can be presented as follows:

Sale price: The sale price in a contract is not surely higher than prices in spot markets. The survey shows that the price in a contract may be fixed and open (i.e., decided when delivering). The fixed price may be slightly higher than the current market price but it may be lower than the spot market price at the delivery time. Notably, the spot market price in Vietnam may strongly and usually fluctuate. In many cases, the spot market price is much higher than the contract price and farmers lose their premium. When the fixed price is much higher than the spot market price at the delivery time, firms may break the contract with a small compensation. If the contract price is open, farmers and firms usually use the market price at the delivery time for the transaction. Thus, the contract does not surely increase the sale price.

Production cost: Even if the contract price is higher than the price in spot transactions, the difference may be offset by cost increase and productivity reduction. Contract farming requires farmers to follow some good practices and obtain higher quality certifications.

Those can force farmers to invest more in machines and equipment, employ better-quality inputs, utilize more labor, and eliminate low-quality outputs. As a result, contract farming may increase agricultural farming costs and decrease farmers' income.

Farming productivity: In practice, crop productivities of contract farmers may be even lower than those without contract farming. The main explanations are that the contract farmers must conform to the processes and standards of good practices to get quality certifications and meet buyers' conditions (e.g., Viet GAP, Global GAP, and Organic). These requirements can forbid farmers to use some chemical fertilizers and pesticides, especially farming chemical stimulants, which may be harmful to people and the environment. The land-use efficiency and coefficient of farmers participating in contract farming are also lower. Moreover, contract farmers must satisfy higher standards of product quality and ripeness. As a result, contract farming decreases crop productivity.

Contract performance: Another reason for the insignificant impact of contract farming on income is the weak contract performance in Vietnam. Specifically, the commitment and trust in the farming contract are relatively low. The farming contract is possibly broken by both sides if the benefit of breaking the contract is notably higher than that of fulfilling it. For example, when the spot market price is much lower than the contract price, firms stop buying products from contract farmers to buy from the spot markets to obtain a lower price, and vice versa. The explanations are as follows: First, the popular forms of contract farming in Vietnam are the oral contract, open agreement, or memorandum. The terms and obligations in these contracts are not really clear and strict. Second, the punishment and sanction of a contract breach are relatively weak and ineffective. Third, Vietnam's law system and justice generally are not very efficient and fair. Fourth, commitment and trust in Vietnam's business transaction and relationships are relatively low.

### 3.2.3. Future Research Agenda

The potential studies in the future may focus on three topics as follows: Measuring the impact of contract farming on income and social welfare: Future studies should divide the impacting process of contract farming on income into two stages. The first stage is to measure the impact of contract farming on the intermediate factors; the second stage is to assess the impact of intermediate factors on income and social welfare. Scholars may test and compare the empirical findings in other contexts with longer contract farming schemes. Contract farming and global food security: Contract farming can broadly be perceived or used as a master food production plan with stable and foreseen prices, quantity, and quality. Thus, contract farming may help "the global food manufacturer" to supply the right foods with necessary quantities, at profitable prices for farmers, and affordable prices for consumers. As a result, contract farming may enhance global food security. Contract farming and sustainability: Through intermediate factors such as food quality standards and other private certifications, contract farming impacts farmers' decisions on choosing suitable production systems, effective methods, and good practices. Those may reduce the negative effect on the environment. A higher and stable income may encourage farmers to maintain and improve soil and water resources. Contract farming is usually accompanied by agricultural cooperatives, certifications, and supporting programs that provide training, consulting, and technology to upgrade the food value chain.

### 4. Conclusions

Contract farming is widely perceived as a key measure for increasing social welfare, improving food quality and productivity, enhancing food security and environmental protection. It helps farmers overcome restrictions such as finance, insurance, access to good inputs, output markets, and lack of technical and managerial capacity. Most studies indicate the positive impact of contract farming on income. However, some empirical results show that the impact of contract farming on farmers' income is not significant or even negative. This article empirically tests the impact of contract farming on income and farming difficulties in Vietnam, and theoretically suggests the affecting mechanism.

The initial results show that the impact of contract farming on income is statistically insignificant. However, the findings indicate that contract farming may facilitate farming activities and reduce farming difficulties. Four factors impact farmers' income, namely education of head, gender of head, type of crop, and technology. In other words, farmers with higher education and more investment in technology may obtain higher income. However, the female farmers seem to produce less income for their households. Pomelo and coconut crops create higher incomes than rice farms. Unexpectedly, the effects of the important factors such as soil quality, cooperative membership, association, supporting policy, and quality certificate are not statistically significant.

The study proposes an affecting mechanism of contract farming on income, sustainability, and welfare as follows: Contract farming initially impacts intermediate factors such as cooperative, market access, knowledge and skill, product quality, technology, and support. These factors then influence capacity, linkage, quality, and certification which can enhance farmers' competitiveness. In the long term, competitiveness, higher price, increasing productivity, and lower costs may significantly improve income, sustainability, and welfare. In general, contract farming has positive impacts on income, sustainability, and welfare in the medium term and long term. In the short term, the results are not significant due to the similar or lower prices comparing to the spot market price, growing production cost, and decreasing productivity. Another reason can be the weak contract performance due to simple agreements, lenient contract terms and obligations, low commitments, inefficient law system, and justice in Vietnam.

The recommendations for future studies are to divide the impacting process of contract farming on income, sustainability, and welfare into two stages. The first stage is to measure the impact of contract farming on the intermediate factors; the second stage is to assess the impact of intermediate factors on income, sustainability, and welfare. Policymakers and researchers need to pay attention to the longer contract farming schemes and effective contract performance to expand contract farming and its benefits. The applications of contract farming should be accompanied by other schemes such as agricultural cooperatives, quality certification, farming consulting and training, access to market information, and technology support. The correlation of contract farming with food security and sustainability is also significant to study.

**Conflicts of Interest:** The authors declare no conflict of interest.

## Abbreviations

| | |
|---|---|
| CFRC | Contract Farming Resource Centre |
| PSM | Propensity Score Matching |
| ESR | Endogenous Switching Regression |
| 2SLS | Two-Stage Least Square |
| OLS | Ordinary Least Square |
| GSO | General Statistic Office of Vietnam |
| ITC | International Trade Centre |
| WB | World Bank |
| GAP | Good Agriculture Practice |
| *Currency* | |
| VND | Vietnam Dong |
| XOF | West African CFA Franc |

| IDR | Rupiah Indonesia |
|---|---|
| CNY | Chinese Yuan |
| INR | India Rupee |
| KES | Kenyan Shilling |
| USD | United States Dollar |

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