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Value-Chain Finance in Greek Agriculture

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Abstract: The primary sector is particularly important in Greece, especially considering the country's current financial crisis, which has lasted since 2010. In an innovative way, this paper investigates the role of Contractual Agriculture as a tool for financing farming production costs in Greece. This study presents the findings of a survey of 222 producers, almost half of whom had used the Contractual Agriculture financing tool, utilizing descriptive statistical analysis via correlation analysis, statistical tests and visual plots such as bar charts. The main findings are that financed farmers are more positive than non-financed farmers about the importance and contribution of the value-chain finance of Contractual Agriculture in covering the cost of production. It ensures an uninterrupted supply of agricultural inputs, improves the possibility of negotiating the purchase price of pesticides and achieves more satisfactory bank terms and conditions for agricultural product financing, as well as the possibility of negotiating the purchase price of pesticides. Finally, in line with previous research, this study found that younger age groups are more hesitant to use this innovative financial tool, and producers with a higher level of education are more likely to use it. This study delves into the advantages and disadvantages for banks, farmers and commercial or manufacturing enterprises involved in such contracts, and its findings offer a comprehensive understanding of the practical implications for participants in Contractual Agriculture and for regulators. Hence, it demonstrates potential areas for improvement in the implementation of Contractual Agriculture in Greece, which could contribute to the growth of the Greek primary sector.

Keywords: value-chain finance; contractual agriculture; economic development; primary sector

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1. Introduction

Contractual agreements in agriculture (defined as "Contractual Agriculture" from here on) are agreements (oral or written) between producers of agricultural products (natural persons or agricultural cooperatives) and buyers (traders or processing companies, the state or private entities). Their goal is for one contracting party to produce agricultural products of a certain quantity and quality, and then, to sell them at a predetermined price to the other contracting party. This agreement is usually of a specific duration. It may specify production conditions, and certainly contains quality and quantity specifications. If a specific price per unit is not specified, then the terms by which that price will be determined must be established.

The bank financing mechanisms of Contractual Agriculture mainly concern the financing of the producer—the supplier—for the cost of production with the basic security of the assignment of the "contract for the future sale of production" that has been concluded with the company—the buyer.

Agricultural production clearly has a multiplicity of financial requirements. A producer needs funds to cover one or more of the following needs: the purchase of agricultural

inputs (seeds, fertilizers, etc.), the purchase of land and equipment, covering unexpected needs, the purchase of plant and animal capital, housing needs, the protection of agricultural crops, and starting a new agricultural or livestock activity. Each of the above is covered by the appropriate instrument.

As demonstrated by [1], the agricultural sector is very important for the Greek economy as it contributes 4.7% of its Gross Value Added and employs more than 400,000 people. This accounts for more than 10% of total employment in Greece. The agricultural industry supports economic growth and prosperity and contributes to social cohesion and the eradication of poverty. At the EU level, Greece held second place after Romania, in terms of the contribution of value added by the agricultural sector to GDP in 2020 (3.5%). Greece held third place, after Romania and Bulgaria, in 2019, in terms of employment in the agricultural sector (10%) and seventh place in terms of population in rural areas as a percentage of the total rural population in the EU (3.6%). In 2020, Greece contributed 3.6% of total agricultural production in the EU, which placed it in eighth in the EU.

Contractual Agriculture is relatively new in Greece. It was legislated in 2011 and it was only in 2013 that the first Greek Bank offered Contractual Agriculture as a product. The authors of [2] emphasized that the Greek legal environment of Contractual Agriculture is considered a major strength for the industry, as the main law (Law 4015/2011) is considered very efficient. In fact, a new piece of legislation (Law 4935/2022) was put in place that provides the incentive of exemption from income tax on 50% of the profits earned by farmers from their individual agricultural business activity, if they have concluded a contract with a specific business buyer funded by Contractual Agriculture. It is estimated that this initiative will support the further expansion of Contractual Agriculture in Greece, which has recently not only gained momentum, but also been recognized as a strategic tool for farmers' survival, economic development, and risk reduction, especially in the context of broader economic challenges.

A diverse range of studies collectively underscores the multifaceted significance and potential of Contractual Agriculture within the Greek agricultural landscape. Since the financing of producers through Contractual Agriculture is essentially a contract between producers, commercial enterprises and a bank, the benefits of Contractual Agriculture and bank financing should be studied on this basis.

Some of the advantages of Contractual Agriculture for producers include scientific assistance and training to improve the quality of the product; enable more efficient use of cultivated land; and reduce the risk associated with selling the product. A guaranteed product price or, in the worst case, knowledge of how it is determined; a guaranteed time of payment for production; and the possibility of financing by the company (even by providing Agri-fees) or access to financial institutions to cover the credit needs of production should be added to this list. In terms of financing, this method helps producers to obtain liquidity for better planning of the production period, to reduce production costs by enabling them to pay off purchases directly (price negotiation) and, thus, to increase profitability.

This paper focuses on the tools offered by Contractual Agriculture to finance part of farmers' production costs (the purchase of agricultural inputs, feed, pesticides, fuel, labor costs, etc.). The main objective of this paper is to explore the financial mechanisms of Contractual Agriculture, particularly focusing on how it facilitates financing for farmers' production costs in Greece. It aims to provide a theoretical assessment of Contractual Agriculture and specialized financial tools. It also presents empirical findings from a questionnaire survey conducted among producers who have chosen to be financed through Contractual Agriculture and those who have not.

In an innovative manner, this paper investigates the role of Contractual Agriculture as a tool for financing farmers' production costs in Greece. It delves into the advantages and disadvantages for banks, farmers and commercial or manufacturing enterprises involved in such contracts. Furthermore, it offers insights from empirical data gathered through a questionnaire survey, providing a comprehensive understanding of the practical implications

and potential areas for improvement in the implementation of Contractual Agriculture for financial assistance in agricultural production.

This paper is structured as follows: First, a theoretical assessment of Contractual Agriculture and the specialized financial tools for the promotion and financing of collaborations between producers and suppliers/buyers is made. The advantages and disadvantages for the banks, the farmers and the commercial or manufacturing enterprises who associate their business with relevant contracts are examined and critically evaluated. Then, the empirical approach is presented. A questionnaire is distributed both to producers who chose to receive financing and to those who did not. The findings are presented and critically evaluated. Finally, the main conclusions are summarized, assessed and compared to previous studies, and the practical implications are presented.

2. Literature Review

The first partnerships that characterized what is now defined as "Contractual Agriculture" were found in the late 19th century in Japan (with Taiwanese farmers) and in the early 20th century in the United States (with Central American producers). Then, cooperative contracts were used in vegetable production in the USA, the seed industry in Europe (in the interwar era), and then, expanded to pork production in the 1940s in America.

Globalization, biotechnological advances, the economic crisis (indicatively [3]) and changes in the eating habits of the world's population are dramatically affecting developments in the primary sector. It is therefore imperative to adapt immediately to the new circumstances. Furthermore, climate change and, accordingly, sustainable development considerations are shaping companies' economic growth [4]. An important step in this direction is Contractual Agriculture and its use as a tool to assist the flow of bank financing to producers.

In Western Europe and North America, Contractual Agriculture finance mechanisms were launched almost a century ago and now cover 40 to 90% of the production of some products. And of course, the banking system has taken care of the financial aspects of Contractual Agriculture for the benefit of all parties involved (indicated in [5–9]).

The importance of contractual agreements for achieving sustainable development objectives in agri-food supply chains has already been highlighted by previous studies for many countries using case studies (indicatively [10–15]). Ref. [16] defined an interpretative model of sustainable innovation processes conceived at the supply chain level and covered the determinants promoting these processes.

Contractual Agriculture has recently gained notable acceptance among Greek farmers, and 14% have already adopted this practice, according to [17]. Moreover, an additional 25% have expressed interest in doing the same in the future. The endorsement of Contractual Agriculture is further emphasized by [18], which highlights the promotion of this approach through cooperative logic. Ref. [18] also emphasizes the role of appropriate financial instruments in enhancing the entrepreneurship and economic well-being of farmers. Ref. [19] delves into the specific programs examined in the study, noting the involvement of export-oriented companies, even in products with prices determined in stock markets. The study observes strong interest from both companies and producers in financing under such contractual agreements. Ref. [20] underscores the significance of Contractual Agriculture and the accompanying financing from banks, viewing it not only as a survival strategy for farmers, but also as a catalyst for the development of the agricultural economy. This, in turn, contributes to the overall recovery of Greece from its economic crisis. Ref. [21]'s analysis introduces demographic factors, indicating a significant desire among farmers to use/participate in Contractual Agriculture. The study identifies a strong correlation between younger ages and higher educational levels, with these groups showing greater interest in this agricultural financing practice.

Ref. [22] sheds light on the perceived benefits of Contractual Agriculture among participating farmers. The highest percentage of these farmers believe that Contractual Agriculture serves as a risk-reduction tool while simultaneously contributing to increasing

their income. Consequently, the study suggests significant prospects for the continued expansion of Contractual Agriculture. Ref. [23]'s contribution to the discourse emphasizes the financial impact of the financial instruments developed by Banks to address the needs of the primary sector, including Contractual Agriculture, revealing that these instruments account for 30% of the changes/upgrades in agricultural production. Ref. [24] provides a historical context, affirming the contribution of the economic crisis to the development of Contractual Agriculture. The study also extracts specific characteristics of the profile of farmers participating in this practice.

Ref. [25] studied cooperative actions in the agri-food chain, specifically the case of Contractual Agriculture in Greece, to determine the attitudes of producers. The results of the research show, as in previous research, that Contractual Agriculture in Greece is still at an early stage of development and that producers are positive about the idea of using it. Still, the survey shows that most producers prefer to establish a contractual link directly with the processing industry, while many producers prefer the commercial scheme "Farmer-Bank-Processor". Another finding of the survey is that most producers believe that Contractual Agriculture does not help to ensure a better price for producers' products, or for the supply of agricultural inputs; however, producers do think that it enhances liquidity through predetermined payments. Finally, the survey shows that producers feel secure in marketing their products and are familiar with modern farming techniques through their association with cooperatives.

Ref. [26] studied Contractual Agriculture in relation to the taxation of farmers and bank financing. In general, Contractual Agriculture was found to ensure stability and reliability for farmers in the market, as well as higher incomes for farmers, since their risks are minimized. Contractual Agriculture farmers have better access to finance and can adapt more easily to market demands. As far as contractors are concerned, the risk here also seems to be the loss of autonomy for farmers and their reduced bargaining power, which may lead to a reduction in prices. However, Contractual Agriculture seems to lead to an increase in the production of quality products.

Ref. [27] carried out research on the reasons that contributed to the development of Contractual Agriculture in Greece. The study shows that the economic crisis was the main motivation for farmers to engage in contract farming and to join it. This is because it led to an increase in farmers' incomes of up to 60% (according to them) and to the absorption of all of their produce at a fixed price, thus offering them security. Regarding finance, almost all farmers (91%) agreed that since Contractual Agriculture offers fixed prices, it is particularly important at the beginning of the growing season. In terms of farmers' satisfaction with the use of Contractual Agriculture, 81.1% were satisfied and 87.8% would urge other farmers to join Contractual Agriculture for the reasons mentioned above.

Finally, studies on Greek Contractual Agriculture have been conducted that focus on specific products and/or specific regions. For example, Ref. [28] studied the characteristics of Contractual Agriculture for wheat in Thessaly, whereas Ref. [29] studied Contractual Agriculture in the Pella Prefecture.

Based on this extensive literature review, several key themes and patterns emerge regarding Contractual Agriculture in Greece. Firstly, there is a notable shift towards the adoption of Contractual Agriculture among Greek farmers, driven primarily by economic factors such as the economic crisis and the need for stability and income security. Additionally, Contractual Agriculture is perceived as a beneficial mechanism for risk reduction and income enhancement, with farmers expressing satisfaction and willingness to recommend it to others.

The literature also highlights the role of financial institutions in facilitating Contractual Agriculture, with specialized financial instruments playing a crucial role in supporting agricultural production. However, despite the overall positive sentiment towards Contractual Agriculture, there are areas of concern as well as potential challenges. These include issues related to pricing mechanisms, farmers' autonomy, and the perceived impact on market dynamics. Additionally, there is a need for further research to explore the nuances of the

implementation of Contractual Agriculture, including its effects on product quality, market competitiveness and long-term sustainability.

This literature review on Contractual Agriculture in Greece suggests several hypotheses for empirical testing. Firstly, farmers' participation in Contractual Agriculture may be positively influenced by economic factors such as the income stability and the security provided by fixed pricing mechanisms. Additionally, demographic factors such as age and education level might correlate positively with farmers' interest and participation in Contractual Agriculture. Despite offering liquidity through predetermined payments, Contractual Agriculture may not always result in better prices for agricultural products. However, it can facilitate access to finance for farmers, enabling them to adapt to market demands and enhance production quality. Nonetheless, concerns regarding loss of autonomy and bargaining power in Contractual Agriculture arrangements may impact pricing dynamics in the market.

This study, motivated by the above, seeks to empirically investigate the dynamics of Contractual Agriculture in Greece by extending the literature on access to the finance–productivity nexus, focusing on the case of the Greek agricultural sector. Greece faced an economic downturn a few years prior to this survey, where the significance of financial services escalated due to credit constraints. Indeed, while the country grappled with a financial crisis, the primary causes were largely linked to Greece's limited fiscal capacity. A crucial advantage which shielded Greece's agricultural sector from the adverse effects of the sovereign debt crisis was its ability to rely on the European Central Bank (ECB) as the ultimate lender. The ECB implemented extensive rounds of quantitative easing in response to the subprime and sovereign debt crises. As highlighted by [30], such policies can have positive or negative repercussions. The central issue lies in the ambiguous nature of the monetary policy spillovers [30], making an investigation into the Greek agricultural sector particularly compelling, and emphasizes the additional value of this study considering the insights from [31]. Specifically, Ref. [31] examined the relationship between productivity and access to financial resources in the US. The authors use a triple difference testing approach and document a causal effect, progressing from access to finance to productivity. They show that areas with comparatively strong access to finance experience the most significant increases in production, even when compared to a control group. Both the present paper and Ref. [31] examine the relationship between finance and productivity in agriculture, utilizing empirical analyses and county-level data. However, they differ in geographical focus, with one concentrating on the Midwest United States and the other on Greece. In addition, while Ref. [31] investigates the impact of bank deposits on productivity in the presence of an exogenous demand shift, this paper explores the utilization of Contractual Agriculture as a financial tool covering production costs and enhancing productivity. Furthermore, methodologically, Ref. [31] employs a triple difference testing approach, whereas in this study, a descriptive statistical analysis and correlation analysis are utilized.

3. Materials and Methods

This study employed a questionnaire carried out from March until May of 2019, divided into 2 sections: one surveying Contractual Agriculture issues, and the second surveying financing issues (see Table A1 in the Appendix for a detailed description of the variables in the questionnaire). Questions used in previous studies [18–24] were incorporated into the questionnaire to allow comparisons and to reveal trends, which are presented in the conclusions section. The questionnaire was distributed to 250 producers, and 222 valid questionnaires were completed. Within the sample of 222 producers, 120 were funded and 102 were non-funded Contractual Agriculture participants. The Contractual Agriculture segment of the questionnaire explored farmers' motivations to join and the perceived benefits of Contractual Agriculture, while the financing section delved into funding sources and financial instrument impacts. This methodology attempted to explore the complex interplay between Contractual Agriculture and financing, offering insights into the dynamics of

agricultural practices during the period specified. The data were analyzed with frequentist statistical analysis, correlation analysis and statistical testing for associations via the X^2 test. Specifically, the frequencies and percentages of variables of interest were presented through visual plots (i.e., bar plots), whereas the correlation analysis utilized Spearman's correlation coefficients.

The sample characteristics are presented in Figure 1 below. In the age structure of the producers surveyed, it is observed that there are significant percentages in all age groups, with the largest percentage occurring in the 41 to 50 age group (62 producers, 27.9%). Male producers clearly outnumber female producers (190 as opposed to 32, or 85.6% compared to 14.4%). It should be noted here (as revealed by the interviews) that in many of the cases where a female producer appears, the reason is the husband's retirement or the fact that he is a wage-earner, and is in fact the invisible operator of the farm. Thus, the percentages related to actual involvement in agricultural activity are even higher for the male sex. In terms of educational level, a significant number of producers (52 or 23.4%) are primary school graduates (mainly older people), while the majority are high school graduates (92–41.4%). More than half of the producers have another member of the family involved in agricultural production in addition to the officially registered farmer. As presented in Figure 1, a significant number of producers (41–18.5%) are engaged in farming alone, with no other family member involved. In 22.5% of the sample (50 farmers) two other family members are involved in farming. In the farming activity of 13 producers (5.9%), three additional family members are employed, and a small number of producers (6) are assisted in farming by more than four family members. Figure 1 clearly shows the family-based approach to the primary sector, as the overwhelming percentage of participants in this survey (75.2%) do not employ any staff or employ only one or two workers. 23% employ between three and five workers, and only 1.8% employ more than six workers. Obviously, these workers are seasonal (when completing the questionnaire responses, an attempt was made to 'annualize' them), and the need for these workers is in direct relation to the product grown. It is noteworthy that in the sample, there are no producers employing more than 10 people. Almost half of the producers interviewed (45%) cultivate privately owned land exclusively. There is a significant percentage of farmers (22.1%) who rent 20% their cultivated land while owning the remaining 80%, and those who maintain an equivalence between owned and rented land (49 producers). The almost-zero percentage of producers for whom rented land exceeds owned land clearly shows the nature of privately owned Greek agricultural production. For 44.1% of the producers in the present survey (98 persons), 80% of their family income comes from agriculture, while 18.5% of the sample (41 producers) have no income other than agricultural income. Almost one in three (16.7% + 16.2% = 32.9%) have about the same amount of income from other sources, and very few (10 producers or 4.6%) have a main source of income other than agriculture.

Simple random sampling was chosen to give all producers the same probability of participating in the sample. The sample consisted of producers who cooperate with the National Bank of Greece—NBG). Some of them are financed by the NBG, while others are not. For at least one of the products they produce, they use the Contractual Agriculture financing mechanism.

Various visual and tabular descriptive analysis methods were used to summarize and present the key results effectively, and relevant statistical tests were applied to determine the main statistical correlations among the categorical variables.

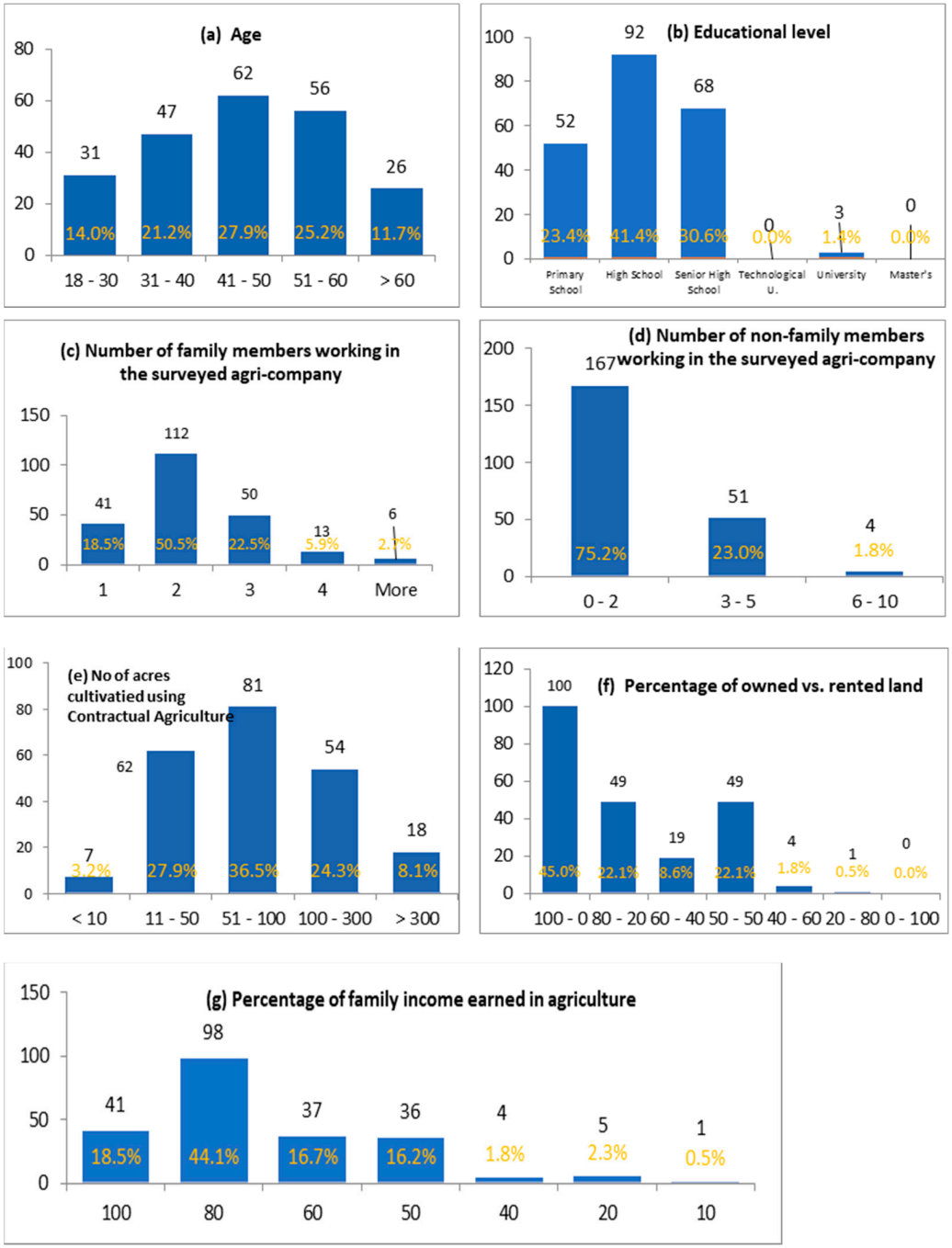

Figure 1. Sample characteristics.

4. Results

The main findings of the study are presented using descriptive analysis in two groups, (a) those relating the qualitative issues related to Contractual Agriculture and (b) those related to the financing issues related to Contractual Agriculture, followed by the statistical correlations. Then, the Spearman correlations between each of the 26 questions in the questionnaire and all the other questions are examined. Finally, statistical tests are conducted to compare funded and non-funded Contractual Agriculture farmers.

4.1. Qualitative Issues Related to Contractual Agriculture

As shown in Figure 2 below, the information about Contractual Agriculture comes primarily (46.8%) from the company that absorbs the agricultural production. Many (28.4%)

learned about it from their colleagues, a significant percentage (17.1%) from the Cooperative to which they belong, and the rest (7.2%) from the mass media or the Internet.

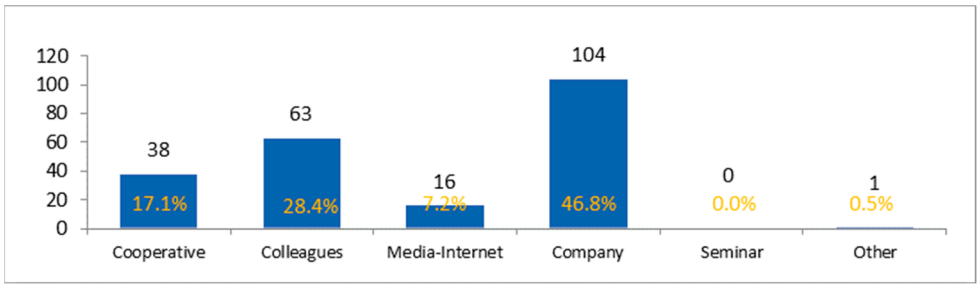

Figure 2. Sources of information on Contractual Agriculture.

Regarding the product cultivated through Contractual Agriculture, the survey participants could choose more than one answer. The results obtained are presented in Figure 3 below. The composition of the surveyed producers according to the product they grow through Contractual Agriculture is as follows: 34% cotton, 10.7% tobacco, 10.2% industrial peaches, 8.6% kiwi fruit, 4.5% industrial tomatoes, 5.3% pulses and 26.6% other products (potatoes, rice, cereals, olives, mastic, vegetables and stevia).

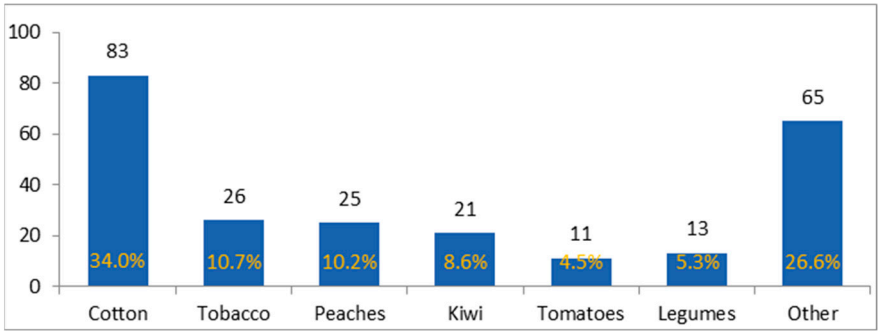

Figure 3. Types of products cultivated using Contractual Agriculture.

In the question concerning the problems of Contractual Agriculture, the producers were able to choose more than one of the proposed answers. Thus, as presented in Figure 4 below, the four problems were as follows: high dependence on the company; lack of coordination and organization; limited bargaining power; and contract commitment. These were reported by approximately 15% to 20% of the producers surveyed. Smaller percentages of farmers reported low prices (8.2%) and conflicts of interest (5.4%), and 57 producers (14.7%) reported that there is no problem with the institution of Contractual Agriculture as they have experienced it.

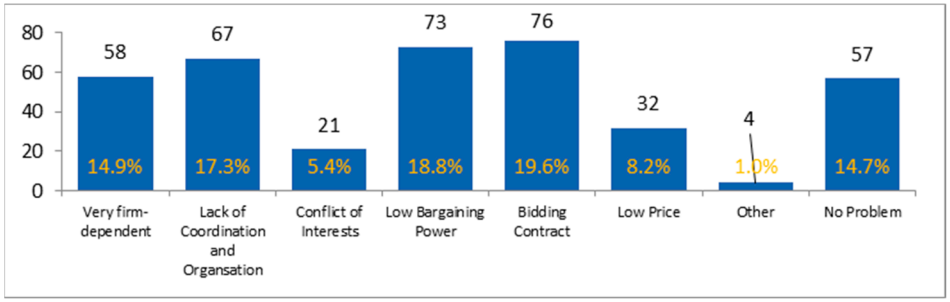

Figure 4. Reported problems of Contractual Agriculture.

As presented in Figure 5 below, concerning the proposal for the difference between the price of the contract and the price of direct negotiation with the wholesaler, 37 producers

report that they agree and 2 of those producers report that they strongly agree (it should be noted that as mentioned above in the question on the problems of Contractual Agriculture, 32 producers report low price as one of the main problems). At the same time, almost half (97 or 43.7%) do not take a position on a possible price difference and 88 producers (39.6%) state that if they did not participate in Contractual Agriculture (with all its commitments and obligations), they would not obtain a better selling price for their product by negotiating directly with any wholesaler.

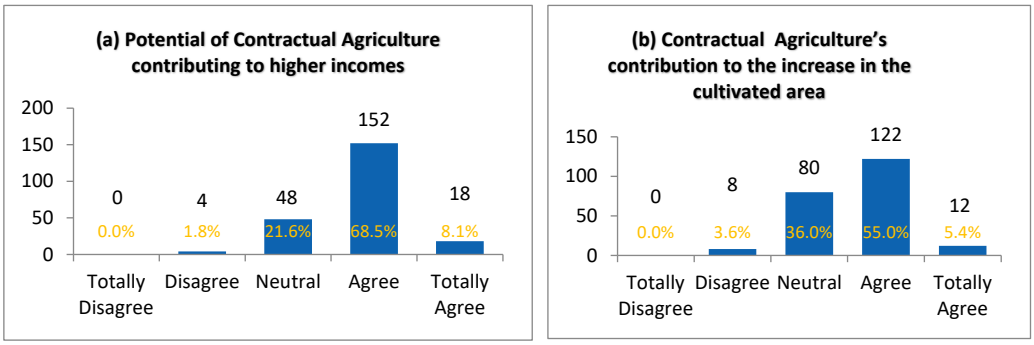

Figure 5. Contractual Agriculture's importance.

Figure 6 below shows that 131 producers (59%) believe that the economic crisis which has affected Greece since 2010 has contributed significantly to the increased use of Contractual Agriculture in the country. One out of four (fifty-six producers—25.2%) reported no opinion on this issue, and thirty-five producers (15.8%) reported that the shift of Greek farmers to the use of Contractual Agriculture is unrelated to the economic crisis.

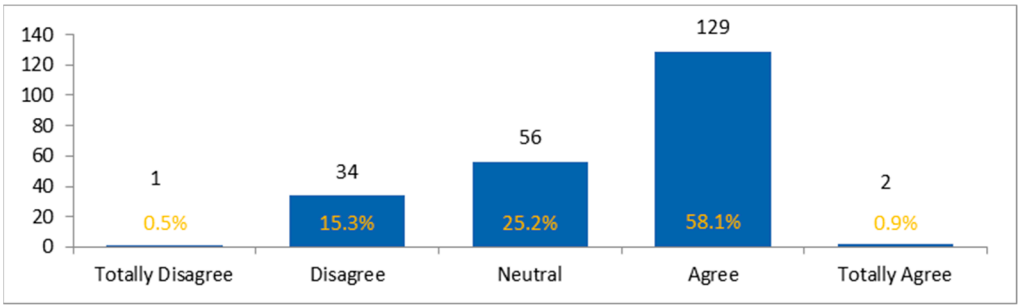

Figure 6. The role of the economic crisis as an incentive for producers to switch to Contractual Agriculture.

Looking at Figure 7 below, one hundred and eighty-two producers (82%) are somewhat to very satisfied with their decision to finance their agricultural production using the Contractual Agriculture financial mechanism. Thirty-five (15.8%) producers feel that they have neither benefited from nor been harmed by their participation and only five producers (2.3%) are somewhat dissatisfied with their decision to use the Contractual Agriculture financing mechanism.

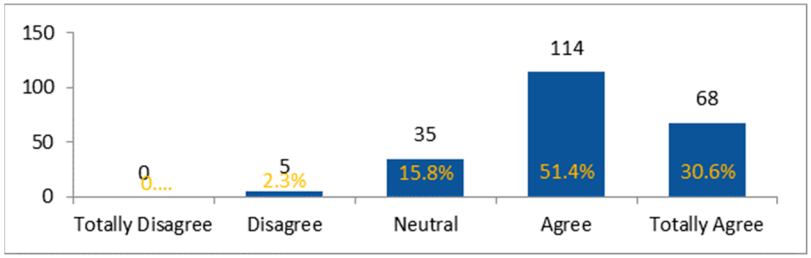

Figure 7. Level of satisfaction with the use of the Contractual Agriculture financing mechanism.

4.2. Financing Issues Related to Contractual Agriculture

It should be noted that approximately half of the sample participants (120, i.e., 54%) were using Contractual Agriculture, while the rest were not.

As shown in Figure 8 below, 60% of the respondents believe that bank financing (by means of Contractual Agriculture) offers security with respect to the full cost of production. One in four (fifty-six producers or 25.2%) have no clear opinion on this issue and 14.9% (thirty-three producers) consider that the use of Contractual Agriculture does not offer security. Similar replies appear with regard to the security offered by bank financing (secured by means of Contractual Agriculture) towards ensuring the timely and uninterrupted supply of the necessary agricultural inputs.

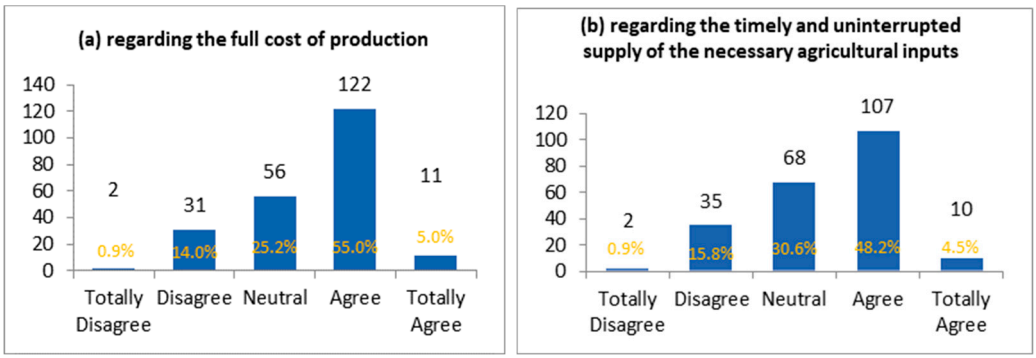

Figure 8. Level of security provided by bank financing (by means of Contractual Agriculture).

On the question of whether buying supplies/pesticides in cash (financed by Contractual Agriculture) changes a producer's bargaining power, the vast majority agree or are neutral, as presented in Figure 9 below.

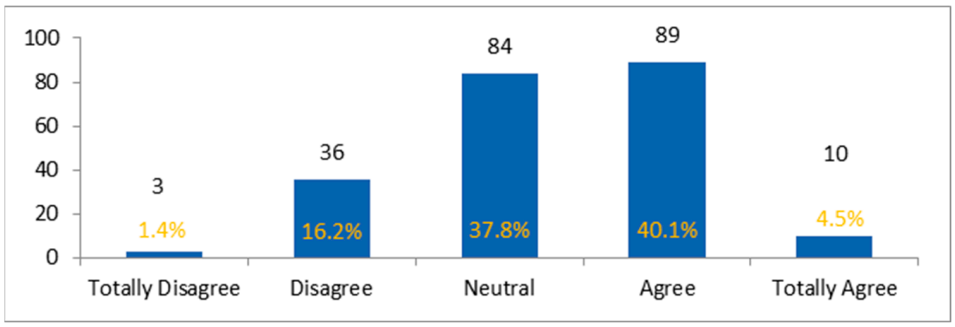

Figure 9. The ability to purchase necessary inputs/pesticides in cash (financed by Contractual Agriculture) changes producers' bargaining power.

As far as fuel supplies are concerned, it seems that there is no room for better prices in the case of cash payment, so it can be seen that more than half of the producers (53.6%) disagree with the proposal, 35.1% of them have no opinion and only 11.3% of the farmers surveyed consider that they benefit from buying fuel in cash (financed by Contractual Agriculture), as shown in Figure 10. Furthermore, labor costs have even less price elasticity with cash payments (financed by Contractual Agriculture). Thus, the answers tend even more towards disagreement than the answers to the fuel question.

As presented in Figure 11 below, regarding financial cooperation with the Bank (costs, conditions, etc.), 36.9% (82 producers) are satisfied. A similar percentage (36–80 producers) has neither a negative nor a positive opinion, and 27% (60 producers) consider that their cooperation with the bank could have been undertaken with better conditions and lower costs. Finally, 45.1% (100 farmers) have a positive view on the contribution of bank financing to their income, 34.7% (77 producers) have a neutral view and 20.3% (45 producers) consider that the cost of financing is probably higher than the income benefits it brings.

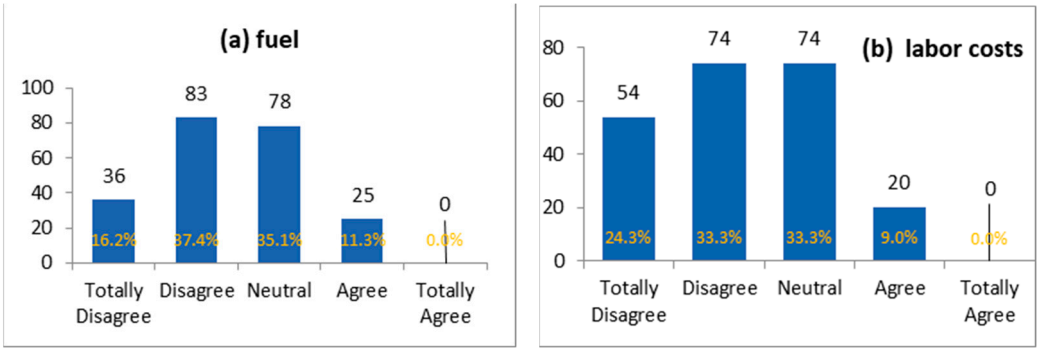

Figure 10. Benefits of specific purchases in cash (financed by Contractual Agriculture).

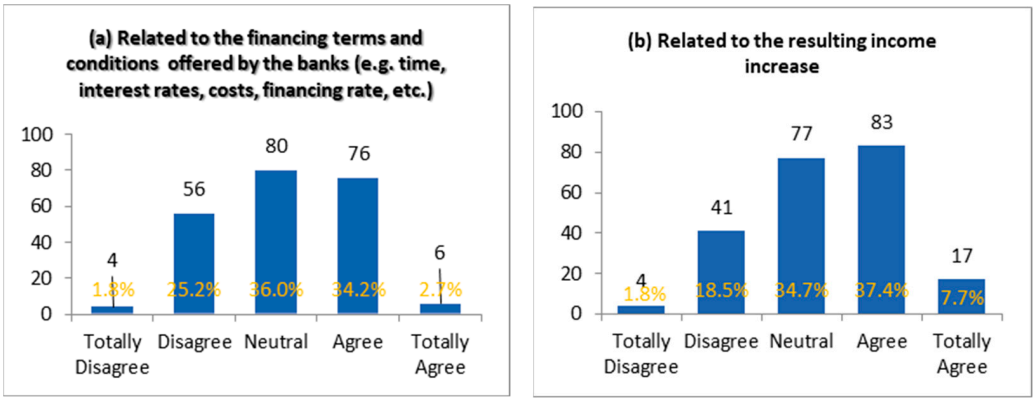

Figure 11. Level of satisfaction with the use of Contractual Agriculture.

Regarding recommendation to their colleagues to use the Contractual Agriculture bank financing mechanism, 113 producers (50.9%) would do so, 59 (26.6%) are neutral and the remaining 50 (22.6%) would probably try to dissuade their colleagues from such a move, as shown in Figure 12 below.

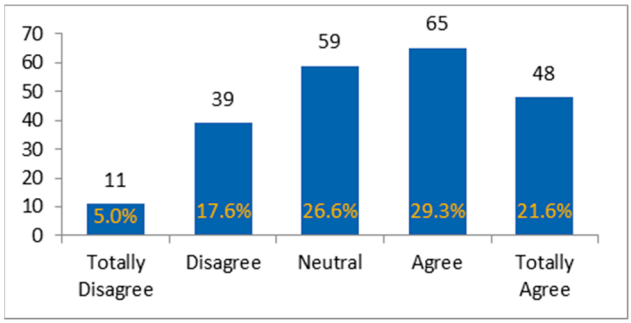

Figure 12. Recommendation to others to join the Contractual Agriculture bank financing mechanis.

4.3. Statistical Analysis

Table 1 below presents the correlations between each of the 26 questions in the questionnaire and all the other questions. Moderately strong correlations between two questions (0.3 < absolute value of Spearman's coefficient < 0.7) are highlighted in yellow and strong correlations (absolute value of Spearman's coefficient > 0.7) are highlighted in red. The correlation of producers who did or did not use Contractual Agriculture funding with all 17 questions (demographic, as well as opinions on Contractual Agriculture issues, etc.) ranges from zero to weak, i.e., there is no strong linear relationship between the use of financing and age, gender or educational level. However, it is noteworthy that as the number of family members contributing to agricultural work increases and as the number of non-family workers employed increases, there is a weak tendency (r = 0.20 and r = 0.28,

respectively) to make greater use of this specific financial instrument. Financed farmers have more positive views than non-financed farmers on the contribution of Contractual Agriculture to covering production costs (r = 0.39), the uninterrupted supply of agricultural inputs (r = 0.38) and the possibility of negotiating the purchase price of pesticides (r = 0.35). Relatively strong correlations exist between the two groups of producers with satisfaction received from bank financing terms (r = 0.38), the contribution of finance to achieving higher income (r = 0.47) and recommendation to their colleagues to also adopt the tool of Contractual Agriculture (r = 0.52).

As presented in Figure 13, in the age groups 41–50 and 51–60 (which are the most numerous in the sample of this study) there are significantly more people who use bank financing in the context of Contractual Agriculture. In the age groups 18–30 and 31–40, those who do not make use of loans are slightly outnumbered, and in the over 60 age group, there is an equivalence. In other words, middle-aged people, who have experience in agricultural and at the same time still have a future in this activity, make use of bank financing in higher proportions under the auspices of Contractual Agriculture. In contrast, younger people (<40) who are just starting out, or have little experience, and older people (>60) who are possibly considering retirement are more cautious about using such banking instruments.

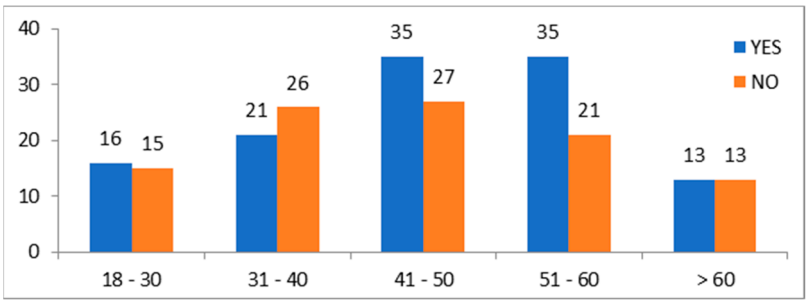

Figure 13. Correlation between age and bank financing.

Looking at the number of cultivated acres in relation to producers who are financed or non-financed by Contractual Agriculture, a fairly weak correlation (r = 0.14) emerges, indicating a slight tendency, as the cultivated area increases, to make greater use of bank loans. In terms of the number of acres in relation to the use of bank financing, producers using Contractual Agriculture to cultivate 100 to 300 acres (54 in total) make greater use of thus specific financial instrument (34 versus 20). Among producers who cultivate more than 300 acres (18 individuals), there are even more who make use of financing (14) versus those who do not (4), as shown in Figure 14 below.

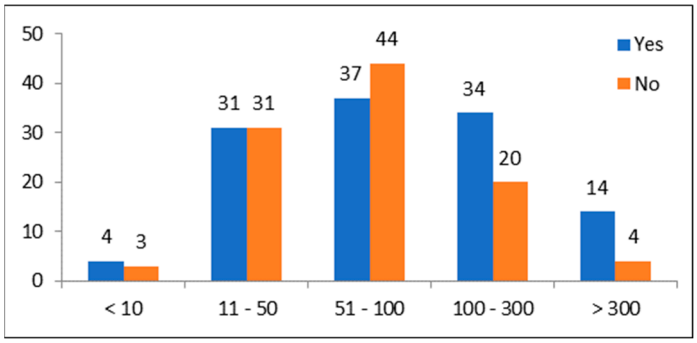

Figure 14. Correlation between acres cultivated and the use (or not) of Contractual Agriculture financing.

Table 1. Spearman's correlation coefficients.

Questions	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	1.00	0.25	−0.53	−0.01	0.10	0.11	−0.08	−0.14	−0.04	0.10	0.17	−0.01	−0.13	−0.05	−0.10	−0.06	−0.09	−0.06	−0.18	−0.15	−0.17	0.06	0.01	−0.08	−0.08	−0.09
2		1.00	−0.08	0.03	−0.07	−0.10	−0.21	0.13	0.00	−0.04	0.05	0.05	−0.06	0.03	−0.06	−0.05	0.01	0.03	−0.10	−0.04	−0.03	0.15	0.21	−0.01	−0.01	−0.04
3			1.00	0.17	0.12	0.14	0.25	0.03	0.07	0.27	−0.12	0.03	0.02	0.17	0.13	0.01	0.15	−0.11	0.16	0.18	0.19	−0.14	−0.15	0.07	0.12	0.15
4				1.00	0.28	0.37	0.21	0.02	0.05	−0.03	−0.21	0.10	0.06	0.09	0.05	−0.14	0.05	−0.20	−0.02	0.06	0.11	−0.02	0.00	−0.01	0.08	0.06
5					1.00	0.65	0.39	−0.35	−0.03	0.20	−0.13	0.04	0.09	0.05	0.05	−0.13	0.02	−0.28	0.09	0.15	0.14	−0.08	−0.16	0.07	0.13	0.16
6						1.00	0.47	−0.45	0.02	0.26	−0.15	−0.03	0.08	0.09	0.09	−0.08	0.02	−0.14	0.05	0.13	0.13	−0.06	−0.15	0.13	0.12	0.13
7							1.00	−0.19	0.05	0.21	−0.12	−0.13	0.07	0.03	0.06	−0.06	−0.01	−0.16	0.01	0.08	0.10	−0.19	−0.25	0.03	0.04	0.08
8								1.00	−0.04	−0.11	−0.04	0.05	−0.03	−0.05	−0.11	−0.06	−0.06	0.07	0.02	−0.02	−0.03	0.02	0.06	−0.07	−0.01	−0.05
9									1.00	−0.06	0.07	0.05	0.07	0.02	0.06	−0.04	0.03	0.04	−0.12	−0.10	−0.09	−0.07	−0.09	−0.06	−0.05	−0.04
10										1.00	0.18	−0.10	−0.21	0.03	−0.03	−0.07	−0.01	−0.16	−0.01	−0.01	0.02	−0.09	−0.15	0.07	0.05	0.04
11											1.00	0.47	−0.23	0.32	0.26	−0.08	0.49	0.05	0.02	−0.07	−0.08	0.09	0.05	0.08	0.07	0.00
12												1.00	−0.12	0.62	0.51	−0.31	0.65	−0.04	0.27	0.22	0.21	0.17	0.16	0.25	0.32	0.29
13													1.00	−0.23	−0.11	0.05	−0.17	0.04	−0.09	−0.06	−0.06	−0.02	0.04	0.00	−0.06	−0.02
14														1.00	0.73	−0.32	0.75	−0.01	0.37	0.33	0.28	0.09	0.05	0.29	0.42	0.35
15															1.00	−0.17	0.63	0.02	0.32	0.29	0.31	0.09	0.05	0.30	0.34	0.32
16																1.00	−0.27	0.10	−0.10	−0.10	−0.08	0.11	0.13	−0.07	−0.14	−0.13
17																	1.00	−0.06	0.29	0.28	0.24	0.10	0.08	0.30	0.37	0.36
18																		1.00	−0.39	−0.38	−0.35	−0.13	−0.04	−0.38	−0.47	−0.52
19																			1.00	0.83	0.76	0.29	0.18	0.63	0.80	0.78
20																				1.00	0.89	0.20	0.10	0.60	0.78	0.78
21																					1.00	0.28	0.17	0.63	0.75	0.75
22																						1.00	0.87	0.34	0.33	0.33
23																							1.00	0.21	0.20	0.19
24																								1.00	0.79	0.80
25																									1.00	0.90
26																										1.00

There is, however, a moderate correlation between the groups of farmers funded by Contractual Agriculture and those who are not funded with the questions related to the financing issues of Contractual Agriculture. Notably, we determined the following:

- Financed farmers have more positive views than non-financed farmers on the contribution of contract financing to covering production costs (r = 0.39); to an uninterrupted a supply of agricultural inputs (r = 0.38); and to the possibility of negotiating the purchase price of pesticides (r = 0.35)
- Stronger correlations are found with satisfaction received from the financing terms of Contractual Agriculture (r = 0.38), its contribution to achieving higher income (r = 0.47) and recommendations to colleagues to join Contractual Agriculture (r = 0.52).

As presented in Figure 15 below, it follows that those who do use Contractual Agriculture are much more positive than those who do not. A neutral view is held by almost the same proportion of producers who take advantage of the financing option as those who do not. Regarding the negative view of banking conditions, farmers who do not make use of Contractual Agriculture are outweighed by those who do. It is noteworthy that 16 producers who are financed by a bank have a negative opinion of the financing terms (apparently, they have had to resort to banking solutions to cover their production needs). Twenty (20) producers who are not financed consider the banking terms satisfactory.

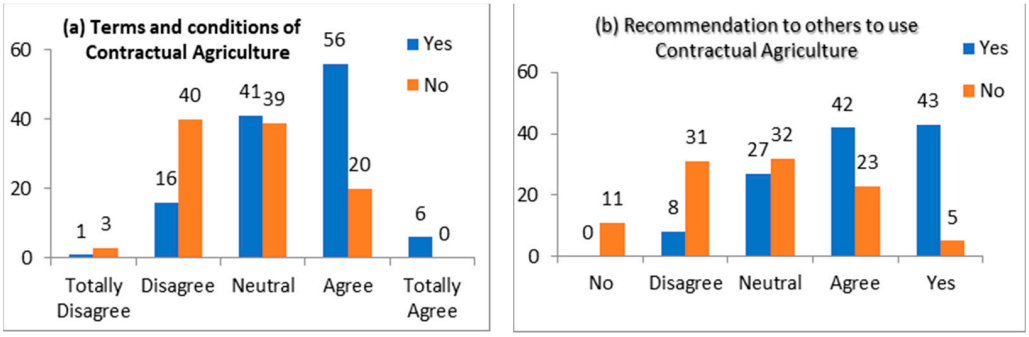

Figure 15. Views of users and non-users on Contractual Agriculture.

4.4. Comparing Funded and Non-Funded Contractual Agriculture farmers

In this sub-section, an attempt is made to compare funded and non-funded Contractual Agriculture farmers through statistical tests. Specifically, the X^2 test is utilized to examine whether the financing of farmers is associated with their responses to the rest of the variables in the questionnaire. The results of the X^2 test are summarized in the following table (Table 2). Only statistically significant associations are included in Table 2. The associations of the funding variable with all the remaining variables were tested and were not found significant.

The results of the statistical testing reveal that among the demographic information, only educational level is marginally associated with the funding of Contractual Agriculture (X^2 statistic = 7.696; *p*-value = 0.091 < 0.1). Those who are funded have a higher educational level when compared to non-funded farmers.

The number of family members and employees is significantly associated with funding, with those receiving funding having a larger number of family members and/or a larger number of employees working in their agri-company when compared to the non-funded farmers (*p*-value = 0.015 and <0.001, respectively).

In addition, the number of acres cultivated is related to the funding of farmers, with funded farmers showing increased cultivation areas (X^2 statistic = 8.530; *p*-value = 0.074 < 0.1). Another important driver of funding seems to be the percentage of family income earned in agriculture (X^2 statistic = 14.080; *p*-value = 0.029 < 0.05).

Table 2. Results of X^2 test comparing associations of funded and non-funded farmers with variables of questionnaire.

Variable	X^2 Statistic	*p*-Value
Educational level	7.696	0.091 *
Number of family members working in the agri-company surveyed	12.264	0.015 **
Number of non-family members working in the agri-company surveyed	19.862	<0.001 ***
No of acres cultivated using Contractual Agriculture	8.530	0.074 *
Percentage of family income earned from agriculture	14.080	0.029 **
Level of security provided by bank financing (by means of Contractual Agriculture) regarding the full cost of production	37.243	<0.001 ***
Level of security provided by bank financing (by means of Contractual Agriculture) regarding the timely and uninterrupted supply of the necessary agricultural inputs	35.444	<0.001 ***
The ability to purchase necessary inputs/pesticides in cash (financed by Contractual Agriculture) changing producers' bargaining power	32.894	<0.001***
Level of satisfaction from the use of Contractual Agriculture related to the financing terms and conditions offered by the banks	33.147	<0.001 ***
Level of satisfaction on the use of Contractual Agriculture related to the resulting income increase	49.304	<0.001 ***
Recommendation to others to join the Contractual Agriculture bank financing mechanism	59.557	<0.001 ***

* Association is significant at the 10% significance level. ** association is significant at the 5% significance level. *** association is significant at the 1% significance level.

Funded farmers agree more than non-funded ones that the level of security provided by bank financing is important, both with regard to the full cost of production and the timely and uninterrupted supply of the necessary agricultural inputs (p-value < 0.001).

Finally, the level of satisfaction concerning the use of Contractual Agriculture is an important driver when comparing funded and non-funded farmers (p-value < 0.001). Finally, those who are funded are expected to more often recommend to others that they join the Contractual Agriculture bank financing mechanism in comparison to the non-funded farmers (p-value < 0.001).

5. Discussion and Conclusions

When compared to previous surveys, the study sample is characterized by an age and educational renewal of the rural population, reflecting the contemporary picture of the rural population of Greece. In total, 90.5% are of the opinion that cooperation with the commercial or processing enterprises which absorb their production through Contractual Agriculture offers them security. A total of 77% believe that the adoption of Contractual Agriculture increases their income, and more than 60% believe that it also helps them to further increase their area under cultivation. In total, 82% of the respondents are satisfied overall with the cultivation of land using Contractual Agriculture. Only 16.5% believe that if they did not have their contractual commitment and negotiated directly with the wholesaler, they would obtain a better price than the cash price offered through Contractual Agriculture. Almost 60% believe that the economic crisis played a catalytic role in attracting farmers to Contractual Agricultural. A total of 60% consider that Contractual Agriculture financing is a useful tool to efficiently cover the production costs of their crops. Regarding fuel (to some extent) and the labor costs of farming (to a greater extent), it appears that the margins and price elasticity of these costs are such that it is difficult for Contractual Agriculture to ultimately provide any benefit in these two areas. Regarding the Contractual Agriculture terms offered, 37% are satisfied, 36% remain neutral and 27% expect better. Over 45% believe that Contractual Agriculture financing ultimately enhances agricultural income, and only 20% believe that the costs outweigh the benefits. More than half would

recommend the use of Contractual Agriculture to colleagues, and less than one in four would try to dissuade them from such a move.

No correlation was found between the demographics of the producers and the use or not of Contractual Agriculture. There is, however, a tendency, as the number of people employed (within or outside the family) in farming increases, to increase the use of the financial instrument offered by Contractual Agriculture. A similar conclusion was reached by [21].

Although the conclusion of [18] is that Contractual Agriculture develops through cooperatives, this study found that only 17% of the farmers in the sample were informed about it through cooperative organizations, while 29% were informed by colleagues and 47% by partner companies. This study supports [16]'s observations on the serious penetration of Contractual Agriculture among farmers, and on the scope for further improvement and development.

The conclusions of [19,20,22,32], who found increasing trends in Contractual Agriculture and contract financing mechanisms in Greece, are along the same lines. As Ref. [33] pointed out, informing producers in the primary sector about these financing mechanisms could further boost their use.

Finally, the associations between funded and non-funded Contractual Agriculture farmers were tested. The findings indicate that educational level, family size, the number of employees, cultivation area, the percentage of family income from agriculture, perceptions of bank financing security, satisfaction with Contractual Agriculture and the likelihood of recommending it to others are significant factors associated with Contractual Agriculture funding among the farmers surveyed.

Many conclusions of this study parallel the findings of [21] in terms of the age structure of the producers interviewed, their educational level, the number of in- and out-of-family participants in farming, the achievement of increased income, the acceptance of bank terms and tariffs, and satisfaction with the institution in general, which pushes them to propose similar practices to other colleagues. Unlike this study, in which no specific trend is evident, Ref. [19] clearly demonstrated that younger age groups and people of a higher educational level prefer Contractual Agriculture.

The findings of this study indicate a positive association between access to finance and productivity, which is in line with the related findings of [28]. This research, however, adds to existing knowledge by specifically examining the role of Contractual Agriculture financing in the Greek primary sector.

The conclusions are that farmers financed through Contractual Agriculture are more positive than non-financed farmers towards issues such as the contribution of contract financing to covering production costs; the uninterrupted supply of agricultural inputs; the possibility to negotiate the purchase price of pesticides; the satisfaction they receive from the bank financing terms; the contribution of financing to achieving higher income; and the recommendation that their colleagues also adopt the tool of contract financing.

The findings of this study align with those of all the previously mentioned researchers. Indeed, there are promising prospects for the further expansion of the use of Contractual Agriculture in Greece.

The dynamics of the agricultural sector in Greece are significant, as shown by [34]. These findings have practical implications for the potential of Contractual Agriculture. Contrary to previous studies which focused only on certain aspects related to Contractual Agriculture, this study provides a holistic evaluation covering both the qualitative and the financial issues associated with it. It provides insights into the perceptions and practices of farmers regarding this financial tool, as well as the factors influencing its adoption, such as age and the educational level of producers. Thus, this study offers valuable empirical evidence and practical implications for policymakers and stakeholders interested in enhancing agricultural productivity and financial inclusion in Greece. It was really only after 2013 that the possibility of using Contractual Agriculture in Greece as a lever for financing the primary sector of the economy (and therefore, the total population of

agri-companies financed by the Contractual Agriculture mechanism) essentially began, as demonstrated by [35]. This limits the importance of the findings obtained. Should an analogous study be conducted in the future, this problem could be addressed, and the results obtained assessed against those of the present study.

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Appendix A

Table A1. Variables in the questionnaire and related categories.

Variable	Categories
Source of information on Contractual Agriculture	Cooperative Colleagues Media-internet Firm Seminar Other
Types of cultivated products using Contractual Agriculture	Cotton Tobacco Peaches Kiwi Tomatoes Legumes Other
Reported problems of Contractual Agriculture	Very firm-dependent Lack of coordination Conflicts of interest Low bargaining power Bidding contract Low price Other No problem
Potential of Contractual Agriculture to contribute to higher incomes	Totally disagree Disagree Neutral Agree Totally agree
The contribution of Contractual Agriculture to an increase in the area cultivated	Totally disagree Disagree Neutral Agree Totally agree

Table A1. *Cont.*

Variable	Categories
The role of the economic crisis in producers' decision to switch to Contractual Agriculture	Totally disagree Disagree Neutral Agree Totally agree
Level of satisfaction from the use of the Contractual Agriculture financing mechanism	Totally disagree Disagree Neutral Agree Totally agree
Level of security provided by bank financing (by means of Contractual Agriculture) regarding the full cost of production	Totally disagree Disagree Neutral Agree Totally agree
Level of security provided by bank financing (by means of Contractual Agriculture) regarding the timely and uninterrupted supply of the necessary agricultural inputs	Totally disagree Disagree Neutral Agree Totally agree
The ability to purchase necessary inputs/pesticides in cash (financed by Contractual Agriculture) changes producers' bargaining power	Totally disagree Disagree Neutral Agree Totally agree
Benefits of purchases of fuel in cash (financed by Contractual Agriculture)	Totally disagree. Disagree Neutral Agree Totally agree
Benefits of purchases of labor costs in cash (financed by Contractual Agriculture)	Totally disagree. Disagree Neutral Agree Totally agree
Level of satisfaction on the use of Contractual Agriculture related to the financing terms and conditions offered by the banks	Totally disagree Disagree Neutral Agree Totally agree
Level of satisfaction on the use of Contractual Agriculture related to the resulting income increase	Totally disagree Disagree Neutral Agree Totally agree
Recommendation to others to join the Contractual Agriculture bank financing mechanism	Totally disagree Disagree Neutral Agree Totally agree

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