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The impact of the agricultural extension on the sustainability of the agrifood industry: The case of contract durum wheat farmers and pasta production in Greece

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Abstract

The main purpose of this research is to examine the association of contract farming and agricultural extension, and its impact to the sustainability of the agrifood industry. Thus, exploring whether this synergy can enhance the production of quality products, the research focuses on a case study of contract durum wheat farmers in Greece. Among the research main findings is farmers' belief to contract farming and agricultural extension that have a significant contribution to certain production factors, such as quality, farm income assurance, farmers' attitude change for improvement and on the promotion of collaboration under the context of the agrifood chain's sustainability. In addition, farmers consider premium quality products being a synergy result of contract farming and agricultural extension.

The research presented in this paper has practical implications for farmers, agrifood industry managers, agricultural policy makers, agricultural extension staff and rural sociology researchers. However, more efforts have to be contacted to examine in depth specialized issues and aspects of contract farming and agricultural extension relationship.

Keywords: contract farming, durum wheat, agricultural extension

Introduction

Nowadays, farmers worldwide face new challenges as conditions for agricultural production constantly modify due to several factors, such as globalization, population growth and migration, climate change, production risks and uncertainties, consumer new dietary preferences, structural changes and technological improvements (Münchhausen & Haering, 2012). Thus, under these emerging conditions, agricultural extension, reflecting on both lifelong experiential learning and vocational training, is a crucial factor to the agrifood industry for enhancing competitiveness to successfully meet new challenges as they lay ahead. In this context, the creation of synergies plays a significant role in the development of the sector. The type of synergy which can strengthen the cooperation and foster collaborative culture is contract farming (Glover & Kusterer, 2016). In particular, contract farming refers to agricultural production being carried out on the basis of a mutually beneficial agreement between the food industry and farmers (Minot &Ronchi, 2015). It is a strategy which has been used worldwide for decades as it provides benefits to both buyers and suppliers with respect to risk and uncertainty (Glover & Kusterer, 2016). More specifically, in contract farming, they agree in advance on the terms of production and specify prices, quantities and quality standards, inputs and provision of consulting services and technical assistance (Simmons, Winters & Patrick, 2005). Thus, farmers are given an assured market for their products, knowing in advance when, to whom and at what price they will sell their products (FAO, 2013). On the other hand, the industry can have an assured supply of primary material of certain quality standards, achieving to have a better planning of the production process (Minot & Roy, 2006). Besides, contract farming is also viewed as an opportunity to enhance agricultural extension focusing on lifelong learning and vocational training apart from being a sterile commercial agreement (Wals, Lans & Kupper, 2012).

In many cases, agrifood firms, in cooperation with agricultural extension entities, organize a wide range of educational activities for farmers who, having ensured their products' sale, are encouraged to participate in these activities (Robinson-Pant, 2016; Minot & Ronchi, 2015). Thus, suppliers under contract often attend information and training seminars to acquire knowledge and skills in order to

optimize their production (Formentini, Sodhi & Tang, 2016). This association of contract farming and agricultural extension can make the cultivation and production processes more sustainable, as it encompasses a wide range of training issues concerning contemporary farming methods.

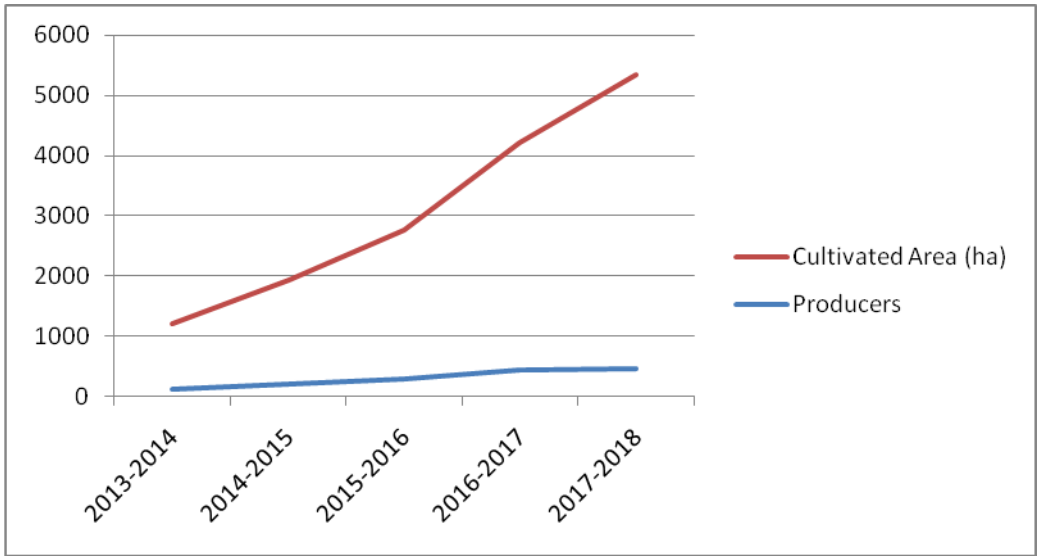
In Greece, Melissa-Kikizas Food Products S.A., is one of the major pasta manufacturers in the country, absorbing each year 100.000 tons of high quality Greek durum wheat (Giannarou, 2015) having a market share of 26% in the domestic pasta market (Nielsen ScanTrack, 2019). From 2013 to date, Melissa-Kikizas Food Products S.A., established a relation with the American Farm School with the scope to organize and execute intensive training and consulting programmes as gradually they applied to 331 individual contract farmers who cultivate approximately 3.200 hectares. These programmes provide up-to-date knowledge and information, as well as, the necessary skills in order them to gain contemporary knowledge and to enhance efficiency in the yield result. It should be noted that the American Farm School, founded in 1904, is among the premier institutes of southeastern Europe for education and research in agriculture, agrifood systems and environmental studies, playing also a prominent role in farmers' lifelong learning and vocational training. To that extend, the institute provides a wide range of sectorial experiential learning and field consulting opportunities to learners in Greece and the neighboring countries over the last decades. Within this context, a training course was designed specifically for durum wheat farmers engaged in contract farming with Melissa-Kikizas Food Products S.A. (Appendix 1).

As indicated in Figure 1, there has been a considerable gradual increase in the number of producers participating in the contract farming program of Melissa-Kikizas Food Products S.A. Also, there is a steady increase in the hectares of cultivated land under durum wheat contract farming.

As part of their training in the *Melissa Wheat Academy*, producers attend classes of experiential learning, acquiring knowledge and skills in precision agriculture, farm machinery efficient use, crop protection methods in correspondence to the environmental protection management, Common Agricultural Policy fundamental principles and production cost management. In addition, farmers visit

the industrial plant and production lines in an effort to create awareness towards quality products and consumers' demands (Giannarou, 2015).

Figure 1: Producers and hectares engaged in contract farming from 2013 to 2018



Each year, a new pool of selected farmers from central and northwestern Greece joins the program, acquiring valuable knowledge and skills, necessary for improving primary product quality. Selection of farmers to join contract farming with the company relates to the following criteria: a) minimum 8 hectares per individual producer, b) 4 hectares per land parcel, c) use of certain durum wheat varieties depending on soil and climate conditions (e.g.: Maestralle, Bronte, Pietrafitta, Claudio, Meridiano, Monastir, and Matt), d) use of certified seed of minimum 160 Kg/hectare, e) soil analysis application per candidate parcel for cultivation, and f) record keeping during cultivation process. Approximately 70% of the initially applied farmers are selected to participate in the program, while a considerable 30% fail to fulfill the required criteria. From those selected, only 40% manage to produce durum wheat according to the preset by the industry quality standards for the explicit market boutique pasta products known as "*Melissa Golden Choice*".

Bearing in mind the recession in Greece over the last decade, the exodus of young people from the countryside and the "brain drain" which has affected negatively the community development potential, investment of people towards training and agricultural extension might play a crucial role to future prosperity opportunities. As Alexandros Kikizas, the firm's CEO highlights in a newspaper interview

"*We noticed that young farmers were leaving their fields and weren't proud about saying they were farmers. At the same time, cost-cutting efforts started to override those to produce a good-quality product, and their potential to raise a family and to have a dignified quality of life were significantly reduced. Thus, the aim of contract farming is to help farmers return back to their fields, to start loving their land, to be proud of what they do, and to come closer to the consumer by learning the needs of the industry first*" (Giannarou, 2015).

On the technical side, farmers' benefits emerge through the application of LISA *(Low-Input Sustainable Agriculture)* and SOCRATEES *(Soil-Crop-Atmosphere and Technology Educational Evaluation Systems)* methodologies (Gertsis & Vasilikiotis, 2018) related to integrated cultivation management *(ifarma – Agrostis, professional farm management software).* To gain that knowledge, producers had to participate in an annual 25 hour experiential learning program, accompanied by another 176 hours field consulting exercises, both dispersed throughout the cultivation period in order to cover seasonal needs in situ. The annual yields become an explicit boutique pasta product by the manufacturer known as "*Melissa Golden Choice*" (Appendix 2).

Participant producers secure the base price of primary production delivered to the company, and besides, gain an average bonus of 4.6 cents per kilo by keeping standard yield quality characteristics. This figure is significantly above the annual regular average market price. On the other hand, the pasta company covers its annual quality yield supplies for producing value added final products that eventually enjoy higher prices in the market compared to similar other products.

Methodology

For the purpose of this study, a combination of qualitative and quantitative research was used in order to examine thoroughly the main parameters. At first, the interview was chosen as a qualitative research tool since it provides an in-depth analysis of opinions and viewpoints and helps to clarify variables utilized later, at the stage of quantitative research (Robson, 2011). Thus, 10 semi structured interviews with contract durum wheat farmers were conducted in private meetings between November and December 2018. The interviews had an approximate duration of 1 hour and the primary data recorded

were used to highlight and determine key points of conceptual axes for the questionnaire which was formed and used later. It is scientifically acknowledged in social sciences that qualitative research can provide valuable information of non-numerical form (Babbie, 2001).

In this case study, the interviews offered insights of farmers' mentality, thoughts, feelings and perceptions giving them the opportunity to express themselves and to reveal various interesting aspects of contract durum wheat farming. The questionnaire was constructed specifically to serve the main purpose of this case study research (Appendix 3). The drawn conclusions are based on the findings of the qualitative research and are supported by international literature reviews. The questionnaire method was used as it is the most widespread and popular research method for gathering data and it is often used in social science research, as results can be easily quantified (Robson, 2011). The questionnaire designed for this research was consisted of fourteen closed answer questions and the respondents' level of agreement, or disagreement with statements was assessed by using a 5-point Likert-type scale questions (Robson, 2011; Vagias, 2006).

The unit of analysis for the present study was contract durum wheat farmers selected with the method of convenience sampling (Babbie, 2001). It should be mentioned that a small, yet carefully selected sample is not necessarily a disadvantage for social science researches, and under special circumstances, can be representative of the whole (Fogelman & Comber, 2007). Therefore, especially in cases in which the population consists of units of different accessibility, the researcher may deliberately resort to subjective selection of a representative sample, at his/her discretion, consistent with the study population profile (Gray, 2014; Fogelman & Comber, 2007). Thus, although the respondents formed a convenience sample, there was a systematic effort to select farmers that were representative of the population.

The questionnaire was initially pilot-tested in January 2019 inface-to-face sessions with five farmers and redefined based on the feedback received. The final survey was conducted between January 2019 and March 2019 and statistical analysis was carried out using the Statistical Package for Social

Sciences (SPSS v.17). A total of 30 questionnaires were handed out and all of them were returned (response rate: 100%).

Findings

In the phase of quantitative research, statistical analysis of the questionnaires initially attempted to outline the respondents' profile (Table 2). Thus, out of the 30 farmers, 26 were men (87%) and only 4 women (14%) with an average age of 42.1 years. The majority of participants (63%) were from the Region of Thessaly, a region characterized by a rich durum wheat tradition, while 7 out of the 30 farmers (23%) were from the Region of Western Macedonia and 4 out of 30 were from the Region of Central Greece (13%). As far as education level is concerned, 12 respondents had senior level secondary education (40%), 6 had post-secondary vocational education (20%), while 12 of them carried tertiary level degrees (40%). At the time, although the average total cultivated land with durum wheat per individual farmer was 28.5 hectares; the average individual contract cultivation with the company was 15.8 hectares (Table 1).

Table 1: Contract durum wheat farmers' profile

Gender	Male: 26 (86%) Female: 4 (14 %)
Age (average and standard deviation)	42.1± 11.2 years
Region	Region of Thessaly: 19 (63%) Region of Western Macedonia: 7 (23%) Region of Central Greece: 4 (14%)
Level of education	Senior Secondary Education: 12 (40%) Post-secondary vocational: 6 (20%) Tertiary Education: 12 (40%)
Current total cultivated land with durum wheat	28.5 hectares
Cultivated durum wheat under contract	15.8 hectares
Average years in contract farming	2

Next, by means of a five-point Likert scale ranging from "*not at all significant*" to "*very significant*" (Vagias, 2006), participant farmers were asked to rate the significance of reasons/motives for

participating in contract farming program. The interviews conducted at the phase of qualitative research pointed out five reasons. More particularly, as indicated in Table 2, ensuring higher price (bonus-Golden Choice) seems to be a strong motivation, since 27 out of 30 farmers (90%) characterizes it as "*very significant*" and 3 of them as "*significant*" (10%). Additionally, 20 farmers (70%) claim that ensuring a lower-minimum price for durum wheat production is a "*very significant*" reason for entering contract farming, while 9 of them consider it to be "*moderately significant*".

Examining the provision of training and technical support at various cultivation stages as a reason for participating in contract farming, 21 respondents believe it is "*significant*" (70%) and 8 of them "*very significant*" (28%). As far as ensuring production disposal is concerned, 19 farmers (64%) claim to be a "*very significant*" reason while 10 of them characterize it as "*moderately significant*". Finally, 21 participants believe that improving the quality of field production is a significant reason (70%) and 9 of them believe it is a very significant reason (30%).

Table 2: The significance of reasons/motives for participating in contract durum wheat farming

Reason/motive	Not at all significant	Not very significant	Moderately significant	Somewhat significant	Very significant	Total
Ensuring production disposal	0 (0%)	1 (3%)	10 (33%)	0 (0%)	19 (64%)	30
Ensuring higher price (bonus-Melissa Golden Choice)	0 (0%)	0 (0%)	0 (0%)	3 (10%)	27 (90%)	30
Ensuring lower price	0 (0%)	0 (0%)	9 (28%)	1 (2%)	20 (70%)	30
Training and technical support at various cultivation stages	1 (2%)	0 (0%)	0 (0%)	21 (70%)	8 (28%)	30
Improving the quality of field production	0 (0%)	0 (0%)	0 (0%)	21 (70%)	9 (30%)	30

Moreover, using a five-point Likert scale ranging from "*not at all significant*" to "*very significant*" (Vagias, 2006) farmers were asked to rate the significance of agricultural extension on certain

fields of contract durum wheat farming. Seven fields were selected taking into consideration the literature review and the feedback provided by the interviews (Table 3). More specifically, agricultural extension for production cost reduction is "*very significant*" according to 5 farmers (17%), *"somewhat significant"* for 15 of them (50%), "*moderately significant*" for 6 of them (20%), "*not very significant"* for 3 of them (10%) and "*not at all significant*" for only one of them. Then, as far as crop protection is concerned, 5 respondents characterized the agricultural extension as "*very significant*" (17%), 18 as "*somewhat significant*" (60%) and 7 as "*moderately significant*" (23%). Moreover, agricultural extension for crop nutrition was characterized as *very significant*" by 6 farmers (20%), *"somewhat significant"*by 15 of them (50%) and "*moderately significant*" by 9 (30%). The significance of the agricultural extension in the field of CAP and new CAP was "*very significant*" according to 3 farmers (10%), *"somewhat significant"* for 11 of them (37%), "*moderately significant*" for 15 of them (50%) and "*not very significant"* for one of them (3%). Then, the significance of agricultural extension in the field of land stewardship was "*very significant*" according to 5 farmers (16%), *"somewhat significant"* for 17 of them (57%) and "*moderately significant*" for 2 of them (6%). Concerning Good Agricultural Practices, 14 respondents characterized the agricultural extension as "*very significant*" (47%), 14 as "*somewhat significant*" (47%) and 2 as "*moderately significant*" (6%). Finally, the significance of agricultural extension on the field of climate change and environment was "*very significant*" according to 5 farmers (17%), *"somewhat significant"* for 19 of them (63%) and "*moderately significant*" for 6 of them (20%).

Table 3: The significance of agricultural extension on certain fields of contract durum wheat farming

Field	Not at all significant	Not Very significant	Moderately significant	Somewhat significant	Very significant	Total
Production cost reduction	1 (3%)	3 (10%)	6 (20%)	15 (50%)	5(17%)	30
Crop protection	0 (0%)	0 (0%)	7 (23%)	18 (60%)	5 (17%)	30
Crop nutrition	0 (0%)	0 (0%)	9 (30%)	15 (50%)	6 (20%)	30
Agricultural policy and new CAP	0 (0%)	1 (3%)	15 (50%)	11 (37%)	3 (10%)	30
Land stewardship and enhancement	0 (0%)	0 (0%)	8 (27%)	17 (57%)	5 (16%)	30
Application of Good Agricultural Practices	0 (0%)	0 (0%)	2 (6%)	14 (47%)	14 (47%)	30
Climate change-environment	0 (0%)	0 (0%)	6 (20%)	19 (63%)	5 (17%)	30

Subsequently, research focused on examining the contribution of contract farming and agricultural extension to certain factors. More particularly, bearing in mind the relevant literature review (Glover & Kusterer, 2016; Swanson, 2008) and the feedback derived from the interviewees at the phase of qualitative research, farmers were asked to evaluate the contribution of contract farming and agricultural extension to five factors (Table 4). Thus, examining at first quality production, 9 farmers consider the contribution of contract farming and agricultural extension "*very significant*" (30%), 17 of them "*somewhat significant*" (57%) and 4 of them "*moderately significant*" (13%). Then, 7 farmers consider the contribution of contract farming and agricultural extension to farm income assurance *very significant*" (23%), 16 of them *somewhat significant*" (54%) and 7 of them "*moderately significant*" (23%). In addition, 6 respondents consider the contribution of contract farming and agricultural extension to improvement of farmers' attitudes *very significant*" (20%), 20 of them *somewhat significant*" (67%) and 4 of them "*moderately significant*" (13%). As far as promotion of collaboration in agrifood chain is concerned, 8 farmers consider the contribution of

contract farming and agricultural extension "*very significant*" (26%), 17 of them "*somewhat significant*" (57%) and 5 of them "*moderately significant*" (17%). Then, focusing on sustainability of agrifood chain, participants 6 farmers consider the contribution of contract farming and agricultural extension "*very significant*" (20%), 13 of them "*somewhat significant*" (43%) and 11 of them "*moderately significant*" (37%). It should be noted that there were no answers at all, considering either "*not at all significant*" or '*not very significant*" the contribution of contract farming and agricultural extension to any of the five factors.

Additionally, the quantitative research showed that the vast majority of farmers, 28 out of 30, (93.3%) believe that *Melissa Golden Choice* is a synergy result between contract farming and agricultural extension. Moreover, 12 farmers claim that premium quality products can upgrade primary production to a very great extent (40%) and 15 of them to a great extent (50%). Finally, 18 respondents highlighted that they would suggest contract farming to other producers to a very great extent (60%) and 12 to a great extent (40%).

Table 4: The contribution of contract farming and agricultural extension to certain factors

Factor	**Not at all significant**	**Not Very significant**	**Moderately significant**	**Somewhat significant**	**Very significant**	**Total**
Quality production	0 (0%)	0 (0%)	4 (13%)	17 (57%)	9 (30%)	30
Farm income assurance	0 (0%)	0 (0%)	7 (23%)	16 (54%)	7 (23%)	30
Improvement of farmers' attitudes	0 (0%)	0 (0%)	4 (13%)	20 (67%)	6 (20%)	30
Promotion of collaboration in agrifood chain	0 (0%)	0 (0%)	5 (17%)	17 (57%)	8 (26%)	30
Sustainability of agrifood chain	0 (0%)	0 (0%)	11 (37%)	13 (43%)	6 (20%)	30

Discussion and practical implications

Nowadays, agricultural extension becomes more important than it used to be in the past, as its function and tasks are increasingly assumed by the agrifood industry and educational institutions (FAO, 2013). Institutions that facilitate extension are significant players in efforts to respond to critical issues such as agrifood chain sustainability, environmental protection and rural welfare. In this context, new synergies, mutually beneficial are required, if sustainability of agrifood chain is to move forward on a win-win basis, both to the industry and farmers. Actions to support synergy built up framework in the agrifood chain requires strengthening the culture of cooperation between all parts of the chain, role enhancement procedures of the agricultural extension and training programmes for new extension employees in terms of required contemporary knowledge and skills to provide up-to date consulting guidance to farmers for absorbing new trends and methods. In addition, new agricultural extension programmes, based on the needs and demands of producers, linked to the agrifood chain sustainability goal, need to be scheduled for implementation. Unfortunately, nowadays in some cases, extension programmes are outdated as circumstances rapidly change, and thus, adjustments to the change may be necessary to consider.

The findings of this research highlight contract durum wheat farmers' opinions concerning the association of contract farming, agricultural extension and the production of quality products. According to farmers, the synergy of these factors is very significant and contributes to sustainability of the agrifood chain. Especially in periods of recession, as it is the case for Greek economy where it suffers high youth unemployment due to the industry's failure to efficiently operate, the association of contract farming and agricultural extension can provide the means of employment opportunities for rural households, particularly in regions where chances for farmers undergoing training to upgrade knowledge and skills are often limited. A further challenge for rural societies is to strengthen these synergies in order to find the right path for rural development and sustainability. Further on, the practical implications of this case study offer interesting insights for farmers, agrifood industry managers, agricultural policy makers, agricultural extension staff and rural sociology researchers.

More specifically, the findings provide a starting point for future research on various aspects of this issue. Thus, similar research can be conducted in other fields of contract farming and agricultural extension, examining for example, the barley and brewing industry, or contract grocery production and supermarkets. In addition, similar approaches might be taken in the livestock contract farming sector. Another interesting parameter to be taken into consideration for further research is consumers' perceptions and attitudes and their awareness for quality products. Bearing in mind that consumers are the key element in the agrifood chain, further research can examine the interactions in depth between farmers, industry and consumers, focusing on the production of premium quality products. Finally, as agriculture and climate change interact to one another, it is recommended to focus research on food security for quality and quantity production. Bearing in mind that good agricultural practices reduce the negative impact of climate, contemporary agricultural extension practices through contract farming can be a leading factor to achieve benefits on this issue.

To sum up, the research presented in this paper builds on our understanding of the connection of contract farming and agricultural extension with the production of premium quality products.

Originality

This research explores an issue which has not been previously examined in the Greek scientific literature dealing with rural issues. Therefore, the case study presented in this paper is an original research, which has not been previously published. The authors take full responsibility for conducted research, data interpretation and conclusions.

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Appendix 1

American Farm School
School of Professional Education
Extension

ΑΚΑΔΗΜΙΑ ΣΙΤΟΥ
Melissa

Training schedule

Venue: Wheat Academy-Larisa
American Farm School Educational Farm - Thessaloniki

Total teaching hours: 25 (Approximately: 32% class & 68% field work)

Time period	Topics per session
November	• Crop nutrition and soil fertility management • Seeding with certified seeds • The grower's record keeping
December	• Good Agricultural Practices and new technologies –(iFarma) • Product costing
January	• Plant protection practices and the environment
February	• Qualitative requirements for the industry • Climate change and CAP
April	• Yield harvesting • Consumer demands
May	• The Pros and Cons of contract farming • Certification exams and program evaluation

Appendix 2

Photo 1: Some of the explicit boutique pasta product (spaghetti) known as "*Melissa Golden Choice*" https://www.melissa.gr/products/chrysi-epilogi/

Appendix 3

American Farm School
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ΑΚΑΔΗΜΙΑ ΣΙΤΟΥ
Melissa

Questionnaire for contract durum wheat farmers (External Services) 2013-2018

1. Gender: male❒female❒ **2.**Age: ……

2. Region: ……

4. Level of education: Senior Secondary Education ❒ Postsecondary vocational ❒ Tertiary Education❒

5. Current total cultivated land with durum wheat (hectares): ……

6. Under contract (hectares): …….

7. Year entered contract farming: …….

8. Evaluate the reasons of participating into contract farming program (5= Very significant, 4=somewhat significant, 3=Moderately significant, 2= Not very significant; 1= Not at all significant):

a) Ensuring production disposal ❒

b) Ensuring higher price (Bonus-Melissa Golden Choice) ❒

c) Ensuring lower price ❒

d) Training and technical support at various cultivation stages ❒

e) Improving the quality of field production ❒

9. In regards to contract farming, up to what extent the agricultural extension could be useful tofarmers?

Not at all	To a small extent	To a moderate extent	To a great extent	To a very great extent
❒	❒	❒	❒	❒

10. In regards to contract farming, how significant is agricultural extension for:

	Not at all significant	Not very significant	Moderately significant	Somewhat Significant	Very significant
a) Production cost reduction	❒	❒	❒	❒	❒
b) Crop protection	❒	❒	❒	❒	❒

c) Crop nutrition ❒ ❒ ❒ ❒ ❒

d) Agricultural policy &new CAP ❒ ❒ ❒ ❒ ❒

e) Land stewardship and enhancement ❒ ❒ ❒ ❒ ❒

f) Application of Good Agricultural Practices❒ ❒ ❒ ❒ ❒

g) Climate change-environment❒ ❒ ❒ ❒ ❒

11. The contribution of contract farming and agricultural extension to:

	Not at all significant	Not very significant	Moderately significant	somewhat significant	Very significant
a) Quality production	❒	❒	❒	❒	❒
b) Farm income assurance	❒	❒	❒	❒	❒
c) Improvement of farmers' attitude	❒	❒	❒	❒	❒
d) Promotion of collaboration in agrifood chain	❒	❒	❒	❒	❒
e) Sustainability of agrifood chain	❒	❒	❒	❒	❒

12. Up to what extent you believe that *Melissa Golden Choice* product is a synergy result between contract farming and agricultural extension?

Not at all	To a small extent	To a moderate extent	To a great extent	To a very great extent
❒	❒	❒	❒	❒

13. Up to what extent quality products, e.g.: *Melissa Golden Choice*, can upgrade primary production in Greece?

Not at all	To a small extent	To a moderate extent	To a great extent	To a very great extent
❒	❒	❒	❒	❒

14. To what extent will you suggest contract farming to the other farmers?

Not at all	To a small extent	To a moderate extent	To a great extent	To a very great extent
❒	❒	❒	❒	❒