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OF THE HELLENIC ASSOCIATION OF AGRICULTURAL ECONOMISTS – ETAGRO INTERNATIONAL SECTION IN AGRICULTURAL ECONOMICS

Sustainable Agriculture, Food Security, and Climate Change: Challenges and Opportunities in Bio-economy

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  [ID: 202010] Ecological-economic modeling of pollination complexity and pesticide use in agricultural crops

- **Stamatis Mantziaris, Angelos Liontakis, George Valakas, Alexandra Sintori & Irene Tzouramani**
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- **Katriina Heinola, Annika Tienhaara & Jarkko K. Niemi**
  [ID: 202015] A choice experiment approach to study farmer's willingness to protein crop cultivation

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ECOLOGICAL-ECONOMIC MODELING OF POLLINATION COMPLEXITY AND PESTICIDE USE IN AGRICULTURAL CROPS

Georgios Kleftodimos[1,*,#], Charilaos Kephaliacos [1], Nicola Gallai[1]
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ABSTRACT

This study tries to evaluate the economic benefit of bees' complementarity in crops production by developing an analytical ecological-economic model displaying farmer's decisions between two agricultural inputs, pollination services and pesticides. Our results highlight that the economic value of this complementarity may offer to farmers an alternative optimum management strategy. This strategy lies on the production range where managed bees are working together with wild ones, offering an enhanced pollination to the crop production. Moreover, we showed that the adoption of a less toxic pesticide or better application methods by the farmers should increase the wild bees' productivity and consequently, the total economic value of pollinators.

KEYWORDS: pollination, ecological-economic modelling, wilds bees, managed bees, pesticides.

INTRODUCTION

Recent years have witnessed a substantial decline of both managed and wild bees in Europe due to the increase of pesticides use (Goulson et al., 2015). Hence, many European agricultural systems depend on the buy/rental of managed bees in order to maintain sufficient levels of pollination services (Allsopp et al., 2008). However, this substitution of wild bees by managed ones apart from costly may be also ineffective as managed bees are not perfect substitutes for wild ones (Garibaldi et al., 2013). In fact, a plethora of ecological studies showed that the presence of both bee species in the field and their complementarity effect generates an enhanced pollination activity which optimizes production (Greenleaf & Kremen, 2006; Brittain et al., 2013). This study tries to evaluate this effect by developing an analytical ecological-economic model displaying farmer's decisions between two agricultural inputs, pollination services and pesticides.

Our results highlight that the economic value of this complementarity may offer to farmers an alternative

optimum management strategy. This strategy lies on the production range where managed bees are working together with wild ones, offering an enhanced pollination to the crop production. Moreover, we showed that the adoption of a less toxic pesticide or better application methods by the farmers should increase the wild bees' productivity and consequently, the total economic value of pollinators.

METHODS

We develop an analytical ecological-economic model displaying farmer's decisions (Wätzold et al. 2006; Doyen et al., 2013) between two agricultural inputs, pollination services and pesticides. Two sources of pollination with different characteristics are considered: managed bees, which can be obtained at a cost, and wild bees, whose population is supposed to be sustained within the farmland. Moreover, we take as a given that the services of wild and managed bees are in a complementary relationship. The general framework used is a single-period optimization problem (Gravelle & Rees, 2004). For the optimization of our production function, we propose a two-stage optimization procedure (Gravelle & Rees, 2004). Firstly, we are minimizing the costs in order to derive the cost function and then, we are maximizing the difference between the revenues and the cost functions.

RESULTS AND DISCUSSION

In this paper, we analyse the importance of the complementarity between wild and managed bees in the production from the economic point of view. We modelized the effects of a possible amelioration of the pesticides' toxicity on bees' population as well as on yield under the economic optimality criteria. We studied the dependence of cost-minimizing management strategies on the target farm output. Given the target, the farmer will choose a certain management strategy in order to minimize the total cost of the output. We have shown that, for a certain range of output level, the farmer has the opportunity to reduce pesticides' use in order to increase the use of wild bees. Thus, the loss of productivity due to the pesticides' reduction is overcompensated by the gain of the enhanced pollination which is offered freely by nature through the complementarity between wild and managed bees. These findings are in accordance with an increasing number of ecological studies which support that a strong and diverse number of bees can replace without any yield loss the reduction of pesticides (Motzke et al., 2015; Sponsler et al., 2019).

Moreover, our model permits us to evaluate the economic value of pollinators in terms of production costs gain (pesticides and managed bees). High use of pesticides in combination with managed bees may help the farmer to achieve higher yields, but with an increasing Marginal Cost (MC). Alternatively, in cases where the degree of complementarity between the two-bee species is high, the farmer is obliged to reduce the level of pesticides in order to keep a minimum number of wild bees to secure his production. This complementarity between the two-bee species has a serious economic value for the farmer as it defines the level of variable costs (pest control and managed bees) as well as farmer's management strategy.

Interestingly, our findings oppose to previous studies which have not considered the contribution of bees' complementarity on crop production (Narjes & Lippert, 2019) or they proposed that optimum management strategy will drive wild bees to extinction (Kleczkowski et al., 2017). Indeed, our results signify that there is an alternative management strategy that the farmer can use to achieve an optimum output. This strategy lies on the "complementarity range" where managed bees are working together with wild ones, offering an enhanced pollination to the crop production. Moreover, in this range, we noticed that a high output with a lower MC can occur, by a moderate use of pesticides without driving wild bees in extinction. Therefore, these findings indicate how the phenomenon of bees' complementarity which has been studied from a plethora of ecological studies (e.g. Brittain et al., 2013; Bartomeus et al., 2014), can be exploited as an economic benefit for farmers and generally for the agricultural production process.

CONCLUSIONS

Here, we proposed an integrated ecological-economic model in order to analyze the relationships that evolve between agricultural production and bee pollination services at the farm-level.

Our results highlight that the economic benefit of bees' complementarity may offer to farmers an alternative optimum management strategy which lies on the "complementarity range" where wild bees are working

together with managed ones, offering an enhanced pollination on the production. Furthermore, we showed that the adoption of a less toxic pesticide or better application methods by the farmer should increase the wild bees' productivity and consequently, the total economic value of pollinators.

However, several simplifications have been made in the modeling process. Firstly, an initial density of wild pollinators in the studied area has been taken into account without calculating the complex reproduction capacities of wild bees (Bryden et al., 2013). Secondly, we considered only two bee species, managed and wild bees. In practice different bee species exist in the landscape with different pollination efficiencies, different life-circles and different responses to pesticides (Cox-Foster et al., 2007). Moreover, we considered that the farm is a closed-system. In fact, wild bees move within the landscapes and provide pollination services. Consequently, wild bees' migration from the surrounding farms or natural habitats may increase the initial wild bees' density. Similarly, as wild bees move in the landscape they can also be affected by the pesticides' use of the surrounding farmers and consequently, their density may decrease. Thus, the actions of one or all farmers in an agricultural landscape affect the regional wild bee stock and consequently, the provision of wild pollination services in their production systems.

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SMALL-SCALE VS LARGE-SCALE FISHERIES: COST-BENEFIT ANALYSIS AND INEQUALITY MEASUREMENT OF THE GREEK FISHING FLEET

Stamatis Mantziaris[1],[*],[#]**, Angelos Liontakis**[1]**, George Valakas**[1]**, Alexandra Sintori**[1]**, Irene Tzouramani**[1]

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ABSTRACT

In the present study, a comparative analysis is carried out between Greek small-scale fisheries and large-scale fisheries in order to draw useful conclusions for the development of an appropriate fisheries policy. The methodologies of extended Cost-Benefit analysis and inequality measures are used. The validity of the results is substantiated by the relevant statistical tests. An important conclusion is that small scale fisheries returns a higher level of social value compared to large-scale fisheries. However, small-cale fisheries reveals a relatively high level of income inequality which requires exploration.

KEYWORDS: small-scale fisheries, large-scale fisheries, cost-benefit analysis, inequality measures, fisheries policy

INTRODUCTION

The national fisheries sector is an important part of the Greek economy as it employs about 25.000 people, providing significant income in regions which in many cases are less favored. Therefore, conservation of fisheries is an important factor in social cohesion and source of income. In particular, small-scale fisheries accounts for about 80% of employees and 95% of vessels. Therefore, the socio-economic analysis of small-scale fisheries compared to large-scale fisheries becomes important as it can provide substantial information on the appropriate formulation of fisheries policy measures. In addition, the contribution of this work can be considered important at the research level as small-scale fishing has not been significantly investigated, especially compared to large-scale fishing (Kolding et al., 2014).

METHODS

This study first utilizes the Cost-Benefit analysis methodology through an expanded framework of not only economic but also social and environmental variables (Crilly and Esteban, 2013). The validity of the results is estimated through appropriate statistical tests such as Kruskal-Wallis H and Mann-Whitney U. In the second stage, well-known inequality measures such as the Lorenz curve and the Gini coefficient are used (Gutiérrez and Inguanzo, 2019). The inequality analysis takes into account not only income, but also other important variables such as landings, employment and effort (days at sea). For the purpose of the analysis, data from 763 vessels are used, which have been collected within the framework of the Greek National Fisheries Data Collection Program for the years 2017-2019.

RESULTS AND DISCUSSION

When analyzing the results of the Cost-Benefit analysis, it was observed that small-scale fisheries returns a significantly higher level of societal value to society for each ton of landings. This result was statistically validated as a statistically significant difference was observed between small and large-scale fisheries (see also Table 1). In addition, a negative correlation was observed between the societal value and the vessel length (see also Figure 1). However, it should be noted that there are no significant differences in societal costs between the two scales of fisheries, but the predominance of small-scale fisheries in terms of societal value is due to the higher level of private profit. Small-scale fisheries can achieve higher prices per ton of landings due to the fact that it utilizes an expanded distribution channel. On the contrary, landings in large-scale fisheries are almost entirely distributed in fish auctions. As regards the inequality measurement, a significant degree of landings inequality was found with the Gini coefficient estimated at about 0.56 for both large and small scale fisheries. In terms of the income variable, small-scale fisheries revealed a higher degree of inequality (Gini coefficient=0.51) than large-scale fisheries (Gini coefficient=0.42). This situation may be explained by the diversity that characterizes small-scale fisheries in terms of the utilized fishing technology but also by the expanded channel in which products are distributed. In terms of the effort variable, large-scale fisheries are characterized by a lower degree of inequality (Gini coefficient=0.14) than

small-scale fisheries (Gini coefficient=0.21) due to the institutional restrictions that apply to large-scale fisheries. Finally, in terms of the variable of employment, small-scale fisheries are characterized by a lower degree of inequality (Gini coefficient=0.24) than large-scale fisheries (Gini coefficient=0.3). This situation may be due to the fact that small-scale fisheries mainly use a specific source of labor, which is the family workforce.
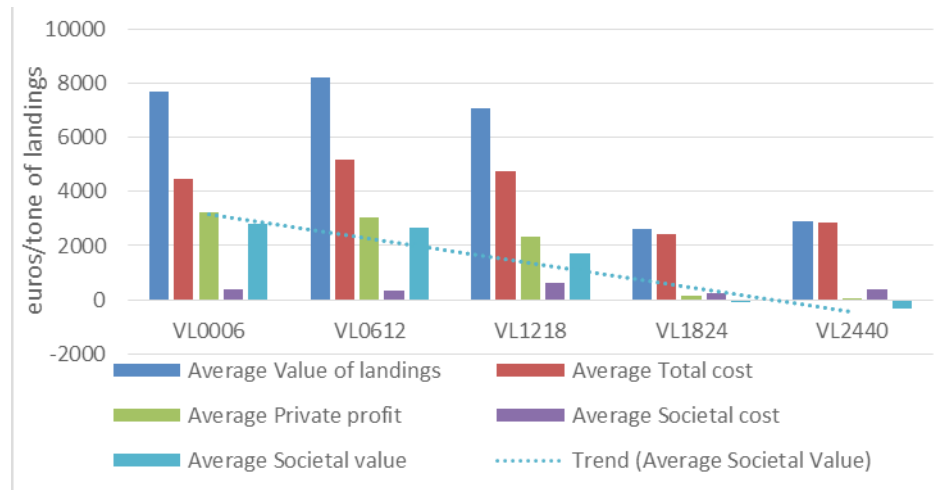
Figure 1. Cost-Benefit analysis main parameters per vessel length class

Table 1. The Mann-Whitney U results for the comparison of societal value by the vessel length of Greek fleet.

	VL0612	**VL1218**	**VL1824**	**VL2440**
VL0006	U=28551￼p= 0.96236	U= 6010￼p= 0.01100	U=1623￼p=0.00000	U=926￼p= 0.00000
VL0612	.	U=18704￼p= 0.00292	U=5086￼p=0.00000	U=2875￼p=0.00000
VL1218	.	.	U=1792￼p=0.00000	U=1021￼p=0.00000
VL1824	.	.	.	U=860￼p=0.06063

CONCLUSIONS

The results of this research demonstrate the need to maintain small-scale fisheries given that the sector can yield significantly higher societal value for each ton of landings compared to large-scale fisheries. However, a concerning issue is the inequality observed with respect to the income variable. This finding should be the starting point for a specialized investigation among the small-scale fisheries segments in order to develop appropriate strategies and therefore policies that will alleviate the degree of inequality.

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A CHOICE EXPERIMENT APPROACH TO STUDY FARMER'S WILLINGNESS TO PROTEIN CROP CULTIVATION

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ABSTRACT

A survey instrument including a choice experiment to study farmers' perceptions and preferences regarding cultivation and the use of legumes, oilseeds and protein-rich special crops was designed. The data were analysed by using a latent class model and logistic regression. The he existence of a credible "marketing" channel and the means to manage the risk of crop damage were important to stimulate cultivation decisions. Policies are encouraged to promote collaboration between farmers, risk management practices and training of farmers.

KEYWORDS: Legumes, oilseeds, choise experiment, survey, incentives

INTRODUCTION

Protein-rich crops such and legumes and oilseeds are a good source of protein and in addition, they can deliver environmental amenities (Bues et al., 2013). Despite their importance in agriculture, the cultivation of legumes and oilseeds has been stagnant and even withering during the recent years and decades. The European Commission (2018) plant protein report recently highlighted the role of markets in strengthening the European protein plant sector. The suggested policy options included supporting farmers to grow plant proteins via the Common Agricultural Policy (CAP) and national CAP plans and improving market analysis and transparency.

The production of protein-rich crops can be challenging when compared to cereals (e.g. Robson et al., 2002; Sillero et al., 2010), and the undeveloped market, limited knowledge of cultivation methods and a lack of self-efficacy can hinder farmers' willingness to cultivate these crops (Suvanto et al., 2020). While weather and market developments are exogenous to the stakeholders, issues related to procurement and contracts can be controlled by the value chain. Hence, stakeholders need information on how farmers respond to options offered to them. The aims of this study were to 1) understand how different production attributes affect farmer's willingness to cultivate protein-rich crops and 2) to characterise farmers interested in cultivating these crops.

MATERIAL AND METHODS

A quantitative survey instrument including a discrete choice experiment to study farmers' perceptions and preferences regarding cultivation and the use of legumes, oilseeds and protein-rich special crops was designed. The choice experiment was used because there were no revealed preferences data to study the cultivation decisions and the role of yield risk. To our knowledge, factors influencing the cultivation decisions concerning these crops have not been studied previously from this perspective.

The following crop attributes and levels were considered in the choice experiment: i) risk of crop damage (levels considered: poor yield once in 20, 10 or 5 years), ii) crop type (oilseeds, legumes, or special crops), iii) mode of 'marketing' harvested yield (used at the farm, sold via a contract before harvest, or buyer searched after the harvest), and iv) gross margin €/ha per crop (range from €300 to €1000 per ha). An efficient experimental design was employed to desing the survey. The data were collected through a structured online questionnaire in July-August 2017. Data collection yielded 308 completed questionnaires.

The choices between the crop, use, risk of crop damages and gross margin sets were modeled with a conditional logit model. We were particularly interested in identifying and characterising farmer segments, where farmers within the segment have similar preferences. A latent class model was used to estimate the segments. The latent class model also enabled the calculation of the willingness to accept (WTA) for each farmer segment. The willingness to accept WTA estimates for different attributes were calculated based on the conditional logit model and the latent class model for those groups for which the cost coefficient was significant. Logistic regression

models were estimated to assess how different demographic and farm characteristics explained the likelihood of a respondent to belong to each of four groups presented below.

RESULTS

The analysis identified four groups of farmers. Group 1 included 40 % of the respondents. Respondents in group 1 preferred less frequent crop damage risk. The group also favored finding buyer after the harvest when compared to contract production, and it did no prefer on-farm use of the harvest. In group 2, which represented 26% of respondents in our sample, (`current legume farmers`), the on-farm use of yield was preferred. In this group, legumes were preferred over oilseeds. Group 3 preferred legumes over other protein-rich crops suggested. This group represented 19% of respondents in our data. However, group 3 frequently preferred to opt-out over the alternatives, and preferred contract production over using the yield in the farm or finding the buyer after the harvest. Group 4 included 15% of respondents and comprised of farmers hardly interested in cultivation.

Table 1 shows statistically significant willingness to accept (WTA) values as gross margin per hectare (€) for each attribute and level of attribute. WTAs indicated that groups 1 and 4 accepted to cultivate crops with the crop damage risk once in 5 years, only when receiving a higher gross margin per hectare when compared to the risk of having the crop damage once in 20 years. Groups 2 and 3, accepted lower gross margin per hectare to produce legumes instead of oilseeds. Respondents in group 2 were willing to produce at a lower gross margin if the yield was used at the farm whereas group 1 accepted a lower gross margin if the yield was sold after the harvest when compared to contract production.

Demographic factors (age, gender, education) and farm characteristics explained the likelihood of a respondent to belong to each of four groups presented above. To highlight some of these characteristics, small farm size, high degree of specialisation and high risk-taking index variable and not having livestock on the farm was positively associated with the likelihood of belonging to group 1 whereas group 2 was typically characterised by livestock farms, a higher turnover, low specialisation in crops, low risk-taking index, and previous familiarity with legumes and special crops. Group 3 included farms with pigs and cattle or farms having very low turnover. Group 4 were typically older farmers, managed a small or medium-sized farm and were less specialised in crops.

Table 1. Average compensation (€ per change from the reference to the alternative level) needed for a farmer to accept an alternative level of attribute when compared to the reference. All effects in the table were statistically significant at 5% or lower risk level.

Attribute and level	Group1	Group 2	Group 3	Group 4
Special crop				
Legume crop		-396	-329	
Oilseed crop (reference level)				
Risk of crop damage once in 5 years	146			302
Risk of crop damage once in 10 years	67			
Risk of crop damage once in 20 years (reference level)				
Buyer found after harvest	-128		755	
Harvest used on the farm	211	-512	1628	
Contract production (reference level)				
Intercept A			813	1388
Intercept B			629	1369
Intercept for opt-out (reference level)				

CONCLUSIONS

The results suggest that it was important that there is a credible "marketing" channel (contract production; sport market; on-farm use (for livestock)) available for a farmer who is considering protein crop cultivation and that

he/she has the means to manage the risk of crop damage. However, the option of contract production appeared very important to a subgroup of farmers. The results suggest that there are opportunities to increase trade of yield between crop and livestock farms and towards small-scale processing companies. Policies are encouraged to promote collaboration between farmers, to invest in risk management practices and training of farmers, and to put effort on developing both contract production and on-farm use of yield.

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HOUSEHOLD FOOD WASTE & POCKETS OF RURALITY IN URBAN FOODSCAPES:
A QUALITATIVE APPROACH IN A GREEK AREA

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ABSTRACT

The main aim of this study is to give a clear evidence of factors (gender, age, place of residence etc.) influencing in Household Food Waste (HFW) composition and to provide valuable information about attitudes and perceptions concerning HFW. The Focus Group Discussion (FGD) method was applied and two sessions were conducted obtaining information from purposely selected participants among rural and urban households in Western Macedonia-Greece. The results reveal a modern and fast-pace lifestyle oriented mostly to tangible goods and disconnected from nature which has profound consequences in HFW composition. The rural past and experiences -factors discussed for the first time in a food waste study in Greece- implicitly prevent the HFW composition. Reliance on qualitative data of a small sample size do not allow the generalization of results. Further, this study is a useful tool to local bodies and policymakers for organising actions and strategies to prevent/reduce food waste and provides valid information that could be used in future research.

KEYWORDS: focus group discussion, Greece, household food waste, qualitative study, rural experiences.

INTRODUCTION

This study is an attempt to provide a clear evidence on factors influencing HFW composition thus to advance the understanding on HFW causes and consequences. Food waste is mainly produced at the "public and household consumption" stage (FAO, 2019) but with differences across countries and localities (World Bank, 2018). HFW composition is strictly connected to the available knowledge-perceptions and the formed attitude (purchases, cooking etc.) (Aitsidou et al., 2019). A plethora of studies have been conducted in recent years around the world

indicating that older people (Nikolaus et al., 2018), males (Cantaragiu, 2019), unemployed, job seekers (Quested et al., 2013) and rural inhabitants (Niles, 2020) waste less food. Nonetheless, there is no clear evidence of these factors (Schanes et al., 2018). HFW composition in Greece does not differ largely from other Mediterranean countries (Capone et al., 2016; Abeliotis et al., 2019). This study is an attempt to interpret the findings in the case of rural and urban areas in Greece (Aitsidou, 2019) that could not be explained statistically. For this purpose, two FGD were conducted revealing the remarkable contribution of qualitative surveys in understanding social phenomena. The modern and fast-paced lifestyle of urban societies, disconnected from nature, has profound consequences in HFW composition. However, the rural past and experiences of city dwellers have a positive influence (prevent) on their HFW composition.

METHODS

Data collection

Data were collected using the FGD method whereby a total of 13 residents (Siemieniako and Kubaci, 2013) of the municipality of Eordaia, located in Western Macedonia-Greece (Hellenic Statistical Authority, 2011), were invited to one of the two sessions held (Guest et al., 2017) – 6 in FGD_A and 7 in FGD_B. Seven participants were women and six men. Their ranged in age from 18 to 67 years. The majority of them (10 participants) live in an urban centre and only 3 live in a rural community. However, all of them have lived (in the past) for a long time period in a rural area.

The purposive sampling technique (Bernard, 2017) was used in participants' selection and an oral informed consent was obtained from each one (Guest et al., 2017). A semi-structured interview guide and a practical guide on food waste reduction/prevention were designed. The sessions were conducted in a quiet, private and familiar location, lasted approximately 2 hours each. During the discussions everyone was encouraged to speak freely, to share their experiences and to record briefly their answers. No recruitments were needed (Dürrenberger et al., 1997).

Data analysis

Participants' responses were coded and checked for consistency by academics-experts in qualitative studies (Khatun and Saadat, 2020). The answers were coded in three major themes, as follows: 1) The impact of demographics, 2) In-depth exploration of attitude and 3) In-depth exploration of knowledge and perceptions on food waste issues. All data were analysed using the content analysis-by hand (Erlingsson and Brysiewicz, 2017). Summaries were organised separately for each theme and a coherent understanding on HFW causes was conducted.

RESULTS AND DISCUSSION

The impact of demographics on HFW composition

The majority of responses indicated that women are responsible for all the food-related household activities (purchases, cooking etc.) hence for the HFW composition. Also, young people are more likely to generate HFW as they are not interested in household food-related activities than older people. This difference is a direct consequence of living conditions (in the past) and experiences. In urban areas, the modern lifestyle includes a "distance" between humans and nature. There is limited time to organise food purchases, weekly meals and healthy dietary habits. Instead, in rural areas there is still time, respect and awareness for nature. Additionally, all the participants have adopted their urban lifestyle to some of their rural (past) food-related habits. High income and higher education are two connected factors leading to impulse and non-organised purchases in a limited time thus influencing negative in HFW composition.

In-depth exploration of attitude on HFW

HFW composition is seriously affected by impulse food purchases and ignorance on food labeling dates while rural experiences and lifestyle raise a positive attitude preventing HFW. Further, the "food sharing" habit was revealed as a particular collective good embedded in cultural values of the rural past connected in other words with the rural idyll.

In-depth exploration of knowledge and perceptions on food waste

There is no link between daily dietary/consumption choices and global environmental issues, e.g. food miles.

Additionally, a weakness in understanding food labeling dates was highlighted, while the economic crisis had a positive influence in HFW composition raising the willingness for prevention/reduction.

Some indicative responses are given in Table 1.

Table 1. Findings' revealed evidence.

Gender	"...my wife washes the dishes after each meal..."
	"...I drive my mother to the supermarket... i help her..." *(laughs)*
Age	"...old age people have lived under difficult circumstances, like wars..."
	"...young people today, once they are born, have an unlimited access to food ..."
Residence	"...we eat tomatoes only mostly during summer..."
	"...young people are not close to nature... we grew up and worked into nature..."
Income & Education	"...there is limited time...i don't have enough energy to cook when i am back to my home...."
Attitude	"...i'm looking for discounts and multipacks...i save money.."
	"...i give eggs and vegetables to my daughter... my grandchildren love them..."
Knowledge &	"...i am not responsible for the greenhouse effect...the sun is..."
Perceptions	"...'use by' and 'expiry' date is the same information written in other words..."

CONCLUSIONS

The results reveal a modern and fast-pace lifestyle of urban societies oriented mainly to tangible goods, disconnected from nature, not including socio-ecological awareness regarding food waste issues. However, the rural past and experiences are discussed for the first time in a food waste study in Greece. City dwellers, due to their rural past, have transferred environmentally friendly food-related habits in their urban households which contributes implicitly in HFW prevention/reduction. This transfer has re-established pockets of rurality (rural values) within contemporary urban living conditions and re-invented the rural idyll (Shucksmith, 2018).

The limitations of the study concern the reliance on qualitative data of a small sample size that do not allow generalization of results across the country (Siemieniako and Kubaci, 2013; Guest et al., 2017). This study is a useful tool to local bodies and policymakers for organising local actions and/or national strategies in order to prevent and/or reduce food waste. The study provides also valuable information for HFW that could be used in further research in the future.

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THE IMPACT OF AGRICULTURAL ACTIVITIES ON THE LIVELIHOOD OF RIPARIAN COMMUNITIES OF NALWEKOMBA WETLAND ECOSYSTEM ALONG RIVER NILE, NAMASAGALI, KAMULI DISTRICT, UGANDA

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ABSTRACT

Land degradation in Uganda is becoming a major constraint to future growth and development of rural livelihoods.

The aim of this study is to investigate the effects of land degradation on agricultural land use in Namasagali, Kamuli District in Uganda and study the socioeconomic and ecological impacts of the degraded Nalwekomba wetland ecosystem. The study was conducted in three riparian villages of Namasagali, Bwiza and Kasozi that highly depended on the wetland for a livelihood. These villages were purposely selected and a sample of 130 households was selected from a list of all residents in the selected villages of farmers using Nalwekomba wetland ecosystem for the season 2020. The results show wetlands in most parts of the riparian communities are under threat of over-exploitation, loss and/or degradation partly due to agriculture and urban land uses. The results show that 73.8% of the respondents were willing to leave the wetland and among these, people belonging to the active working groups took the highest percentage (below 42 years). There is thus a need to design strategies tailored to developing an alternative livelihood option for the wetland dependent communities for restoration of the wetland as well as achieving the on-going Sustainable Development Goals.

KEYWORDS: land degradation, livelihoods, wetland system.

THE IMPACTS OF CLIMATE CHANGE ON CROPLAND ALLOCATION, CROP PRODUCTION, OUTPUT PRICES AND SOCIAL WELFARE

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ABSTRACT

The objective of this research is to simulate climate-change impacts on agricultural production and food prices under partial equilibrium. Our model incorporates a system of price and quantity indices that link structurally estimated community-level vegetative-agriculture supply functions to market-level demand functions. The supply estimation allows for corner solutions associated with disaggregate land-use observations. We use the model to assess climate-change impacts in Israel, which protects local agriculture by import tariffs. We find that the climate changes projected for Israel are beneficial to farmers, particularly due to the positive impact of the forecasted temperature rise on field-crop production. Fruit outputs are projected to decline, and reduce consumer surplus, but to a lower extent than the increase in total agricultural profits. Nearly 20% of the profit rise is attributed to farmers' adaptation through land reallocation. Abolishing import tariffs effectively transfers surpluses from producers to consumers, but the impact of this policy on social welfare becomes positive only under scenarios of relatively large climate changes.

KEYWORDS: climate change, adaptation, agricultural land use, structural analysis, agricultural support policy.

INTRODUCTION

The purpose of this paper is to model and simulate the impact of climate change on agriculture, food prices and consumer welfare. Economic assessments of climate-change impacts on agriculture that ignore price responses to changes in supply could lead to misleading conclusions. Owing to their ability to capture economic interactions among quantities and prices of multiple products and regions, general and partial equilibrium models are powerful tools for assessing climate change effects on agriculture. This paper attempts to fill a methodological and empirical void by combining a structural econometric farm-level model of farmland allocation with an aggregate supply-demand model. This empirical framework is capable of exploiting disaggregated data of farmers' production decisions and its sample heterogeneity and therefore avoids the aggregation bias of partial and general equilibrium models that rely on the supply behavior of representative agents only. Our use of disaggregated data allows the treatment of prices as exogenous at the farm level and endogenous at the industry level. The estimation of crop supply with disaggregated land-use data requires accounting for corner solutions. The explicit formulation of production and output prices enables linkage to the demand, as well as the exploitation of market-level data so as to assign production interpretation to the estimated coefficients of the land-use model.

METHODS

Our modelling approach assumes a recursive decision-making process, in which farmers allocate land across crop bundles (i.e., fruits, vegetables and field crops) at the beginning of the growing season based on their anticipated end-of-season per-hectare profits, which are based on farmers' long-term experience with weather events during the growing season. Hence, spatial variation in climatic conditions leads to spatial variation in the anticipated profitability of crop bundles, which in turn dictates the observed spatial variation in land allocation across bundles. The specification of profit functions enables us to use disaggregated crop-acreage data in combination with aggregate production quantities to estimate per-hectare production and cost functions. Our modelling approach consists of three stages. First, we estimate farmers' response to climate change, in terms of crop portfolio choices, farmland allocation among crops, and quantities produced, using spatial climate variability. Second, we use the first stage results to derive aggregate supply of agricultural products, and interact it with a demand model to derive equilibrium food prices and quantities, from which we can compute consumer welfare.

Finally, we simulate the model using climate change forecasts in order to derive future food price and consumer welfare responses to climate change.

RESULTS AND DISCUSSION

The data used for estimation covers the period 1992-2002, and the climate forecasts are for 2040-2080. While temperatures are forecasted to rise throughout the period, precipitation is expected to decline. We consider three aggregate crop bundles: vegetables, field crops, and fruits. While most field crops are freely imported to Israel, vegetables and fruits are mostly protected. Hence, we treat the price of field crops as exogenously equal to the world price, while the prices of vegetables and fruits are endogenously determined in the local market. However, we do allow imports of vegetables and fruits once their local prices reach a certain threshold.

Simulation results show that about 5% of cropland will shift from fruits (which will suffer from the rise in temperatures) to field crops (which will benefit). Combined with the effect of lower precipitation, this will lead to the decline in the supply of fruits and the increase in their price. For vegetables and field crops, the negative effect of lower precipitation on supply does not entirely counteract the positive effect of higher temperatures. As a result, the supply of both vegetables and field crops will rise throughout the simulation period. The price of vegetables will decline as a result of the higher supply, and this will partially counteract the increase in supply. In total, the supply of field crops will rise more than the supply of vegetables.

Farmers' profits are projected to rise by about 50% for field crops and vegetables and decline by 10% for fruits. Total farmers' profits are projected to rise by 7% only, because of the large share of fruits in current crop profits. Nearly 20% of the profit rise is attributed to farmers' adaptation through land reallocation. Consumer welfare is projected to decline under the prevailing restricted trade policy, but the increase in farmers' profits is much larger than the loss in consumer welfare, and hence total economic welfare will rise. Hence, climate change will be beneficial to Israel. Shifting to a free trade in agricultural products is projected to reduce farmers' profits compared to the prevailing restricted trade policy but to increase consumer welfare, and the overall welfare effect of such a shift is positive under the more extreme scenarios of climate change but not under more moderate scenarios.

CONCLUSIONS

Having a reliable measure of the effects of climate change on agriculture and food prices is particularly important as governments and international organizations alike are called upon to revise current policies in order to adapt to climate change, and to integrate agricultural policies with a broader set of policies targeting sustainable development and natural resource management. Furthermore, taking food prices into consideration is extremely important given its relevance to the critical issues of poverty, food security and malnutrition around the world.

Agricultural adaptation to climate change calls for governmental intervention. The analysis presented in this paper implies that, in their intervention, governments should take into account the impact of climate change on both producer and consumer surpluses. For example, our simulations predict that the surpluses of both producers and consumers of fruits in Israel (under the restricted-trade scenario) are going to decline, whereas the effect on the surpluses of vegetable producers and consumers is positive; hence, proactive adaptation efforts should be directed towards fruits.

3ʳᵈ INTERNATIONAL SESSION
TRAINING, SKILLS AND INFORMATION
IN THE AGRICULTURAL SECTOR

CHAIRPERSONS: Alex Koutsouris (AUA) & Maria Partalidou (AUTH)

PROFESSIONAL TRAINING OF NEW FARMERS
THE CASE OF STUDENTS OF THE AMERICAN FARM SCHOOL VOCATIONAL
TRAINING INSTITUTE

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ABSTRACT

The rapid socio-economic and technological developments taking place internationally have greatly influenced the performance of the agrofood sector, and consequently, those individuals and organizations who are actively involved to its progress and development. Thus, in an ever changing environment in developed countries, farmers are faced with ever increasing challenges connected to technology, financial crisis, new consumer patterns and demands, climate change, needs and issues of environmental preservation, food security issues, growth of agrofood multinational businesses, and the intriguing influx of cheaper agrofood products from the developing countries (European Parliament, 2017). These developments inevitably affect the sustainability of the agrofood sector in Greece, which is called upon to efficiently operate in a fluid and unstable environment with challenges and opportunities where knowledge, information, experiential Lifelong Learning and vocational training are dominant tendencies.

In harmonization to those challenges, the American Farm School (AFS) launched a new postsecondary vocational training entity, the Vocational Training Institute (AFS VTI hereinafter), with the aim to provide specialized knowledge, and technical and entrepreneurial skills to students initially in 4 majors: Agricultural

Operation Manager, Organic Farming Technician, Technician of Standardization, Processing and Marketing of Agricultural Products, and Arborist and Alternative Tree Crop Technician.

The courses corresponding to the above majors are carried out through experiential learning methodologies accomplished on campus in order students to efficiently acquire contemporary scientific knowledge and specialized skills capable to ensure competitiveness in their future professional career. The educational process includes separate mandatory theoretical and practical class work, as well as a mix of both, while the prerequisite for awarding final degrees is the successful participation in the national certification examination. Besides, industrial internship is compulsory for the successful completion of the degree, and it includes six months of supervised work exclusively related to the field of studies. Besides, it counts as a prerequisite to getting licensed for practicing the profession[1].

To our experience, this is an ideal opportunity for students to acquire a variety of initial professional skills. Particular emphasis is given in the hands on dimension of training, engaging in the equation the School's certified quality assurance production systems educational farm, or the so called "Living Laboratory". The trainees become exposed to real production conditions, beyond the classroom and laboratory environments. To that effect, the purpose of this investigation was to analyze the views of young farmers regarding individual dimensions of vocational training enhanced by experiential learning methodologies. In addition, the pedagogical impact of teaching methods was analyzed in terms of gained contemporary knowledge and skill improvement at the completion of first year of studies at AFS VTI.

The design of the questionnaire was rather comprehensive than complex for the audiences (Robson, 2011) and through specially formulated Likert-level questions attempted to capture the views of trainees on a number of issues concerning the importance of vocational experiential training.

The population that took part in the research was forty six first-year students, mostly men (91.3%) from all over Greece, employed in agriculture as the main professional activity (84.5%). It was revealed that they find it absolutely necessary to participate in training programs (93.5%), while recognizing that it is linked to knowledge and skill improvement for developing a firm future professional consignment in the agrofood sector. To that effect, experiential learning applications subsequently assist program participants to cultivate and grow a better understanding for innovation, which undoubtedly affect the path of agribusiness investment sustainability, and entrepreneurial thinking. Although current national sectorial progress has taken significant steps ahead, it seems that it still isn't satisfactory in terms of competitiveness. However, there always has to be tension to gradually execute such methods of professional experiential learning from specialized educational organizations, to concretely reach out higher levels of improvement in rural development, alongside with other important eminent and specialized factors. It is worth noting that a significant proportion (56.5%) of young farmer students had no other opportunity of participating into vocational training, and/or retraining processes prior to their enrolment at AFS VTI, which, to our knowledge and experience, is a potential obstacle to updating and optimizing contemporary knowledge and skills in today's agricultural profession. Although some progress has been recorded over the past few years on the subject of individual level training, a significant infrequent participation in the majority of young farmers still exists (Siavellis, 2019; Lioutas, Tzimitra-Kalogianni & Charatsari, 2010). Factors contributing to the occurrence of this phenomenon perhaps become a major subject of further research in order to investigate this issue in detail. Perhaps the non-satisfactory path of the current general situation of the agrofood sector in Greece (19.6%) connects with the limited training opportunities young farmer have at their disposal. However, our research showed evidence of optimism for the future. Evidently, there will be opportunities of vocational training with experiential learning methods for young farmers to becoming a multiplayer force and the spearhead for rural development, because they will be educated, de facto adaptable to changes, and more receptive to new technologies, innovative practices and investment actions. To that end, we recon that the vehicle of theory-practice connection becomes particularly important, as practical skills developed daily in the pilot plants and in other relevant facilities of our institute, capable to complement theoretical knowledge achieved in the classroom. Thus, young farmer students take advantage of the experiential learning opportunities not to only get acquainted with the theory, but also to put into practice innovative and good agricultural production optimization practices, while developing environmental awareness. As a

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1. https:///:proson.eoppep.gr/el/Qualification Types/Details/56

result, daily contact with their subject areas absolutely connects to the "real world" of subsequent future careers. In addition, young farmers emerge having to play an important role of acting socio-economically (Petrou & Koutsou, 2014) when emphasis is given to establish sectorial values and qualities, obviously crucial to the development of rural areas. In this context, exploring young farmer student views on the issue of vocational training is particularly important and can provide useful feedback. To that extend, this research provides a starting point of reference in "preparing the ground" for further investigation.

KEYWORDS: individual dimensions, young farmers, vocational training, sustainability.

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PERCEPTIONS OF THE IGENERATION TOWARDS TRACEABILITY SYSTEM IN FOOD SUPPLY CHAINS: ORGANIC VS CONVENTIONAL

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ABSTRACT

The aim of this paper is to reveal concerns and motives of the iGeneration in Greece towards traceability system in food supply chains. Two types of young consumers in Greece were examined based on their purchase frequency of organic food, the organic and non-organic consumers. Several factors related to their attitudes, acceptance and willingness to pay for a traceability system were analysed using multivariate statistical analyses. Key insights towards the implementation of a traceability system suggest a potential focus on conventional production and non-organic consumers with higher education and food safety, quality and nutritional value concerns. The results of this research can be used as a tool for predicting future market trends.

KEYWORDS: consumer behaviour, exploratory factor analysis, logistic regression, willingness to pay, food safety.

INTRODUCTION

Nowadays, food crisis has made food safety an issue of intense public concern. The food scandals and scares-initiated changes in the European food policy and legislation. According to Regulation (EC) No 178 (2002), there were new principles such as risk analysis. Traceability also introduced an integrated food chain from farm-to-fork built up with the aim of improving food safety in European Union, ensuring a high level of consumer protection, restoring and maintaining confidence in the European food supply system. Thus, the traceability systems hold a vital role in the marketing of foods at a European and international level. The effectiveness of a traceable food system relies not

only on adopting technology but also on the support and recognition of consumers. Therefore, their acceptance and willingness to pay (WTP) are crucial towards effective implementation of a traceability system.

Traceability is an essential tool for ensuring both production and product quality (Becker, 2000) and a principle adding up to food safety and consumer confidence (Kehagia et al., 2007). Van Rijswijk and co-authors (2008) found that consumers' benefits associated with traceability are related to health, quality, and safety. Studies have shown that consumers are improving their awareness of traceability (Beske et al., 2014; Ortega et al., 2011), and subsequently, their WTP for traceable food products (Wu et al., 2016; Zhang et al., 2012). However, in literature less attention has been given to examine consumers' WTP for different types of food (conventional and organic) with a traceability system and even lesser attention in exploring young consumers' perceptions on the topic. The importance of generations in marketing research is well acknowledged due to cohorts' similar characteristics, for example iGeneration or Generation Z cohort, people who born after 1994 (Williams et al., 2010), includes the most educated, mobile, and connected consumers to date (Babin & Harris, 2016). Moreover, the significance of focusing on young generation relies on the fact that this way we can track and forecast changes in the marketplace emerging from the entrance of new cohorts with a new value system, wants, and needs (Schewe & Noble, 2000).

For this purpose, the objective of this paper is to reveal concerns and motives of the iGeneration in Greece, investigating those factors which influence their attitudes towards traceability system and recognizing their WTP for traceable conventional and organic tomatoes. Analysing the sample, two types of young consumers exist in terms of purchase frequency: the iGeneration organic and non-organic consumers. In this research, organic consumers are defined as they who buy organic products frequently and non-organic consumers who purchase rarely or never.

METHODS

Survey research was performed in young consumers in Greece via an online questionnaire (Ilieva et al., 2002) from May to October 2019, leading to a sample of 1134 valid questionnaires. The methodological procedure involved validity and reliability testing through the implementation of Exploratory Factor Analysis using the principal components extraction method (varimax rotation) and Cronbach's alpha. Also, normality, non-parametric and linearity tests were applied. Logistic regression was employed identifying those factors that positively or negatively affect consumer's decisions related to the adoption of a traceability system. The binary logistic regression model is used to estimate the probability of a binary response based on one or more predictor variables (Norusis, 2012; Hosmer & Lemeshow, 2000).

RESULTS AND DISCUSSION

The profile of each consumer type is presented in Table 1. Principal Component Analysis identified five factors accounting for 56.2% of the total variance: *Quality-Nutritional value*, *Trust-Production method*, *Food safety*, *Price* and *Health*. The results of Logistic regression indicate that the variable *Trust-Production method* is the most significant factor which positively affects organic consumers of the iGeneration which is in line with another research (Van Rijswijk et al., 2008). On the other hand, the *Quality-Nutritional value, Food Safety* and *Education* are the variables which positively influence non-organic consumers which is consistent to previous studies (Christophorou Kehagia et al., 2017; Van Rijswijk et al., 2008).

According to iGeneration's WTP for traceability system, the results show that there is an established WTP for a traceability system with several percentages of price premiums depending on the type of product and the level of price. For instance, the price premium for conventional tomatoes with traceability system is 38.75% and 62% for organic consumers, but 40% and 64% for non-organic consumers, respectively. Regarding the price premium for organic tomatoes with traceability system, there is no significant difference between the types of consumers. Finally, it is notable that the WTP in types of consumers is significantly higher on the conventional tomatoes' scenarios compared to the other scenarios.

Table 1. Profiles of the iGeneration

	Organic consumer		Non-organic consumer	
Sample	45.9% (520)		54.1% (614)	
Frequency of buying organic products	44.2% (230) Every week		Rare 76.5% (470)	
Gender	76.9% (400)	Female	73.0% (448)	
Education level	87.9% (457)	University	87.9% (540)	
Annual household income	35.2% (183)	<7999€	43.2% (265)	
Marital status	99.2% (516)	Unmarried	98.9% (607)	
Percentage of shopping by respondent	37.7% (196)	85%-100%	43.2% (265)	
Acceptance of traceability system	95.8% (498) 4.2% (22)	Yes No	93.2% (572) 6.8% (42)	
Factors which influence their acceptance	Trust-production method** (+)		(+) Quality-Nutritional value* (+) Food Safety* (+) Education*	
WTP	Mean price €/Kg	% Price Premium	Mean price €/Kg	% Price Premium
1st scenario:0.80 €/Kg conventional tomato 2nd scenario:1.50 €/Kg organic tomato 3rd scenario:0.50€/Kg conventional tomato 4th scenario: 2.00 €/Kg organic tomato	1.11 1.72 0.81 2.20	38.75 14.67 62.00 10.00	1.12 1.72 0.82 2.20	40.00 14.67 64.00 10.00

Note:*, **denote statistical significance at the 5% and 10% levels, respectively

CONCLUSIONS

Key insights from the overall profiles, for an implementation of a traceability system, suggests a potential focus on conventional production and non-organic consumers with higher education and food safety, quality and nutritional value concerns. These findings have both managerial and policy implications. Supply chain stakeholders (e.g. producers, traders, logistics and retailers) could be collaborated under a traceability scheme, especially concerning conventional products. Policy-makers should examine the possibility to regulate traceability, considering the acceptance of young consumers. Moreover, this research can be used as a tool for predicting future market trends.

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DIGITAL SKILLS: THE GAP BETWEEN YOUNGER AND EXPERIENCED FARMERS IN S-E EUROPE

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ABSTRACT

The article presents the findings of research carried out in the framewotk of the WiseFarmer (ERASMUS+) project aiming at exploring the usage of digital tools among young and experienced farmers in Croatia, Greece, Hungary, Romania, Serbia, Slovakia. The results showed that farmers' digital skills are defined from their socio-demografic profile. Such evidence has practical implications in the development of certain policies and customized digital tools training.

KEYWORDS: farmers; digital skills; South-Eastern Europe

INTRODUCTION

Information and Communication Technology (ICT) is defined by the World Bank (2011) as "[...] any device, tool, or application that permits the exchange or collection of data through interaction or transmission." It "includes anything ranging from radio to satellite imagery to mobile phones or electronic money transfers". Nowadays, following the technological revolution in the IT sector and industry, the usage of digital tools in Europe is becoming widespread across all sectors, including agriculture (see also Koutsouris, 2006; 2010a; 2010b; Mildorf, & Charvát, 2012).

Understanding and combining the local knowledge of experienced farmers with the digital skills of younger new-entrants into agriculture is the objective of the WiseFarmer project. Such a combination has not been explored yet either through research or public/government statistics (for similar researches see Alexopoulos et al, 2010; Csótó, 2015; Michailidis et al., 2010).

- The hypotheses developed from the literature review and the scope of this article, are as follows:
- The farmer's level of digital skills is related to farmer's age.
- The farmer's level of digital skills is related to farmer's typical educational level.
- The farmer's level of digital skills is related to farmer's experience of internet use.
- The farmer's extraversion and willingness to discuss farming issues is related to their farming experience.
- The farmer's extraversion and willingness to discuss farming issues is related to their intention to provide help or services to other farmers.

METHODS

In the first place, an interview guide was developed for in-depth interviews in all target-areas from Croatia, Greece, Hungary, Romania, Serbia, Slovakia (October - November 2019), to "hear the farmers' voice". A small number of young and senior farmers were interviewed (snowball sampling). Based on the findings of the

interviews a questionnaire was developed; the survey was conducted between December 2019 and January 2020, taking into account the two predefined by the project criteria: on the one hand, all interviewees were smallholder and family farmers and, on the other hand, they were both young farmers (up to 40 years old) and senior/elder/ experienced farmers. A total of 265 valid questionnaires were collected. The data were analyzed with SPSS.

For data analysis, the digital skills indicator is used, which covers four competence domains: information, communication, content creation and problem solving. For each of the four domains, a set of activities have been selected (between 4 and 7), to reflect the competences outlined within each domain of the Digital Competence Framework, with the purpose of discriminating between people having, or missing, the basic skills (European Commission, 2016). Three levels of digital skills ("no or low", "basic" and "above basic") are computed for each of the four dimensions and then an overall composite indicator is computed following a similar logical approach (for the EU28 countries see: https://composite-indicators.jrc.ec.europa.eu/social-scoreboard/explorer?primarychart=worldm ap). Additionally, the number of contacts (other farmers) with whom the farmer discusses farming issues is constructed as a variable to illustrate the extraversion and openness of farmers in terms of communication and (social) interaction.

Cross-tabulation analysis was performed between the variables to reveal any presence of relationship between dependent and independent variables, its direction and its level (chi-square tests of variable independence, with the use of Phi and Cramer's-V coefficients).

RESULTS AND DISCUSSION

The results indicated a statistically significant difference between young and senior farmers in terms of their level of digital skills, i.e. information, communication, content creation and problem solving with online services and software skills, as shown in figure 1. Similarly, statistical difference was observed between the level of farmers' digital skills and the amount of time they already using the internet for any purpose. Furthermore, the farmers with higher formal education are those who showed higher level of digital skills, using a variety of ICT tools in their personal and working life.

The results also indicated a statistically significant difference between the level extraversion and interaction with other farmers and the willingness to provide help and services to other farmers, as shown in figure 2. Moreover, there is a statistically significant correlation supporting the hypothesis that farmers who provide help and services to other farmers tend to regularly discuss farming issues with more people than those who do not provide help and services. Figures 1 and 2 visually demonstrate the trend and influence among the variables.
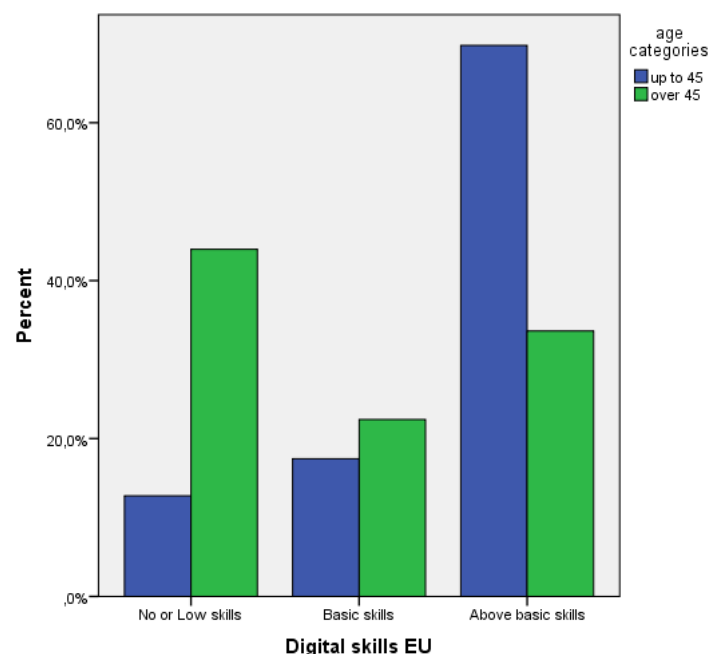
Figure 1. Bar chart with percentages of the level of digital skills per age category, Stats: x2=40,696, p<0,001 / φ=0,293, p<0,001
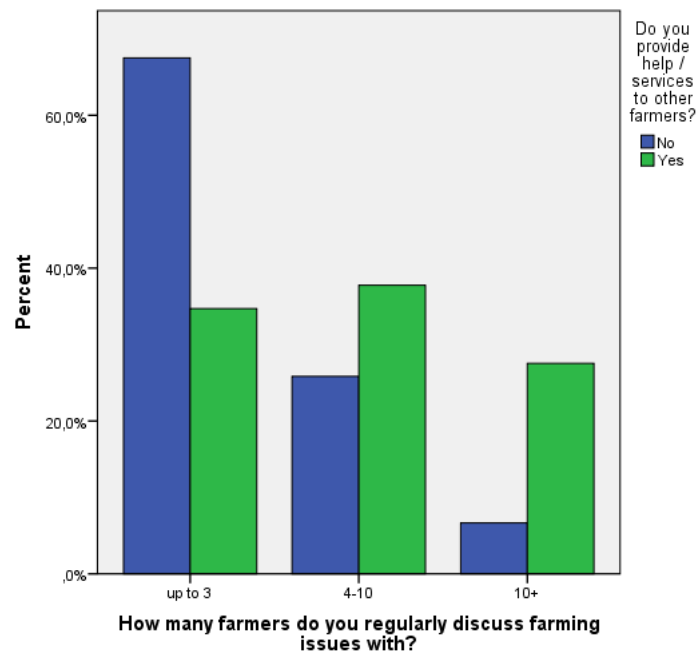
Figure 2. Bar chart with percentages of the number of interacting farmers and the willingness to provide help and services, Stats: x2=28,119, p<0,001 / φ=0,359, p<0,001

CONCLUSIONS

The analysis of the primary data showed statistical significance in the relationship between digital skills of farmers and their age, formal education level and years of internet use. It also showed statistical significance between the interaction with other farmers and their farming experience and their willingness to provide help and services to other farmers. Thus, all the hypotheses developed through the literature review and the scope of the study are verified. It should be taken into consideration that the sample was limited in size and derived from different countries implying a difference in digital infrastructure and availability of digital tools and farmers' cultural characteristics. This is in line with Räisänen & Tuovinen (2020) recent work arguing that the main reasons pertaining the non-use of the internet are the lack of internet access and the lack of digital skills as well as the fact that compared to urban communities, rural communities do not have equal opportunities (thus they are characterized as the 'last mile of connectivity'). The evidence provided has practical implications in the development of certain policies and customized programs that could raise awareness regarding the advantages of the exploitation of digital technology and social interaction for farming purposes as well as digital tools workshops, based on age, educational level and extraversion of the farmers. Further research collecting data, among others, on farm size, production system and the like, possibly addressing a larger sample would provide a more thorough insight on the topic.

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FARM ADVISORS IN FRONT OF AGRICULTURE 4.0: KEY COMPETENCIES AND CONCEPTIONS OF THE DIGITAL FUTURE

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ABSTRACT

The digitalization of agriculture poses new challenges to farm advisors who, as key-actors in agricultural knowledge and innovation systems, play a pivotal role in the transition from physical-social farming systems to Agriculture 4.0. To cope with the increased levels of complexity associated with such a shift and to guide the transition process, advisors should develop a wide range of competencies. The purpose of this study was to cluster these competencies and to examine how advisors' conceptions of digitalization affect the importance they attribute to each one of these clusters. Using data from a sample of 74 advisors, and following a mixed research design, we identified seven competency clusters. Among them, technology translation, intermediation, and value generation competencies were rated as significantly more important by participants. To cope with the transition process, advisors are trying to hybridize these competencies with "analogue" skills. Moreover, the analysis confirmed that the importance attributed by advisors to the different clusters of competencies depends on their conceptions of digitalization. Our results point to the idea that the competencies needed by advisors to guide the transition to Agriculture 4.0 are future-specific, suggesting the need to pay close attention to the ways different actors perceive and understand digitalization.

KEYWORDS: agriculture 4.0, farm advisors, smart farming, digitalization, competencies.

INTRODUCTION

Intelligent agricultural technologies are gaining considerable attention from both industry and academia, while simultaneously the development of new, highly sophisticated technological applications generates great expectations for the future of food and agriculture. Some of these technologies can act as potential game-changing innovations for the agrifood sector, improving the current status quo of agrifood production and supply (Klerkx and Rose, 2020). The transition to what is termed smart farming, digital agriculture, data-driven farming or Agriculture 4.0 is a radical change which is on its way (Lioutas and Charatsari, 2020), transforming the traditional physical-social farming systems to complex cyber-physical-social systems consisting of different actors who collaboratively institutionalize technologies and produce value (Lioutas et al., 2019b).

This transformation generates high levels of uncertainty associated with the reorientation of roles and practices for the involved actors (Lioutas et al., 2019a). Farm advisors and other meso-scale actors have to manage farmer uncertainty during the transition to Agriculture 4.0 (Higgins and Bryant, 2020), by successfully integrating situated knowledge with the intelligence offered by smart appliances (Rose et al., 2018). In this vein, advisory services can enhance the value-generating capacity of these systems (Newton et al., 2020). Indeed, advisors occupy a dual role in the digital transformation of agriculture. On the one hand, they have to facilitate the transition to a digital future (Vecchio et al., 2020; Ayre et al., 2019) by helping farmers make sense of the "smart" tools they are using (Eastwood et al., 2019) thus extracting value from their application (Klerkx et al., 2019), while, on the other hand, they continue to offer tailor-made advice and products to their clients (Rijswijk et al., 2019). This multiplicity of roles generates the need for new knowledge and competencies (Klerkx, 2020), essential for advisors' capability to deal with the increased complexity of the digital agricultural knowledge and innovation systems (Fielke et al., 2020). At the other end of the spectrum, the ways advisors conceive digitalization may affect their beliefs about their efficacy in dealing with Agriculture 4.0, and therefore the perceptions they hold of the key competencies needed to facilitate the transition to a digital future for farming. In this work, we aim at clustering the professional competencies required by advisors to guide the transition to Agriculture 4.0, and at uncovering the ways their conceptions of digitalization affect the importance attributed to these competency clusters.

METHODS

Data for this study were drawn from a sample of 74 agronomists working as farm advisors in different regions of Greece. To identify clusters of competencies associated with the transition to Agriculture 4.0 we developed a list of 23 items which, then, were factor analyzed. Moreover, based on recent theoretical and empirical work, we a priori divided conceptions of digitalization into four categories: digitalization as a potential threat (Baryshnikova et al., 2019; Rotz et al., 2019), digitalization as disruption (Lioutas and Charatsari, 2020; Klerkx, 2020), digitalization as evolution (Fastellini and Schillaci, 2020), and digitalization as a promise (Delgado et al., 2019; Ribarics, 2016). Bivariate and multivariate statistics were used to analyze quantitative data, whereas qualitative data were thematically analyzed.

RESULTS

The analysis uncovered seven different clusters of competencies, referring to facilitation, visioning, reflection, technology translation, value generation, needs assessment, and intermediation. The importance attributed by participants to technology translation, intermediation, and value generation was significantly higher than that of the remaining sets of competencies. An interesting finding was that participants' conceptions of digitalization affect the importance they attach to different clusters of competencies. The conceptions of digitalization as a threat or disruption were found to be significantly associated with the perceived importance of needs assessment, visioning, and value generation competencies. On the other hand, the conception of digitalization as a promise showed significant associations with technology translation and intermediation competencies. Our thematic analysis confirmed these results, also highlighting that advisors face considerable difficulties in hybridizing "analogue" competencies with new capabilities needed to help farmers during the transition to Agriculture 4.0.

CONCLUSIONS

The present work uncovered seven different clusters of competencies that determine advisors' ability to facilitate

the transition towards Agriculture 4.0. Our results indicated that different conceptions of digitalization affect the importance ascribed to these competency clusters. This finding underscores the need to pay more attention to and understand the ways different actors make sense of the interface between physical and digital worlds, and imagine alternative scenarios for the future (Dfuva and Dfuva, 2019; Rijswijk et al., 2019), revealing in parallel that the competencies needed to facilitate the transition to Agriculture 4.0 are future-specific.

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4th INTERNATIONAL SESSION
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- **Foteini Kyriazi, Dimitrios Thomakos & Anthony Rezitis**
  [ID: 202007] Agricultural subsidies, land size and output: A micro-panel analysis for Greece

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  [ID: 202021] The impact of post-2020 CAP reform proposal on farmers' income and the environment: The case of Greece

- **Christina-Anna Kalogeropoulou & Ekaterini Tsopanoglou**
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- **Maria Proestou, Nicolai Schulz & Peter Feindt**
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- **Dimitris Kremmydas, Athanasios Kampas, Stelios Rozakis, Konstantinos Tsiboukas & George Vlahos**
  [ID: 202023] A farm modelling approach to evaluate the abolishment of the CAP historical model after 2020: The case of Greece

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AGRICULTURAL SUBSIDIES, LAND SIZE AND OUTPUT:
A MICRO-PANEL ANALYSIS FOR GREECE

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ABSTRACT

We examine the distributional, economic characteristics and the corresponding impact of agricultural subsidies in Greece and propose a novel theoretical model which attempts to explain the interaction between hours worked, land size and subsidies. We find that there is a strong, possibly non-linear, relationship of subsidies to farm size and thus to their contribution to the added value of agricultural production. Small farms can act as a productive disincentive, when large farms drive the most of agricultural value-added – and this is a clear signal for using subsidies as a way to generate increasing returns to scale in agriculture. Our theoretical model and estimation results on it strongly support the above.

KEYWORDS: agricultural subsidies, utility function, productivity.

INTRODUCTION

In this paper we examine, the distributional, economic characteristics and the corresponding impact of agricultural subsidies in Greece, using an extensive and unique micro-panel dataset and propose a novel theoretical model which attempts to explain the interaction between hours worked, land size and subsidies, as a choice for each individual farmer to maximize utility, subject to income and production function constraints. Our analysis and results follows through the vast strand of the literature on farm size, labor input and productivity, Berry and Cline (1980), Barret C. (1996), Carletto G. et. al. (2016) , Assuno and Ghatak (2003), Townsend et al. (1998).

METHODS

We use a double-pronged approach. In the first part of the paper we use a micro-panel dataset with data referring to four years, namely 2008, 2010, 2012, 2014 and containing all available information of agricultural subsidies decoupled or not. Furthermore, we use in our analysis Gross Value Added in Agricultural, for the period 2000 to 2016 which is available by municipality. We estimate a cross sectional threshold regression to find the impact of land size, with particular intervals, on agricultural subsidies. In addition, we find the estimated average land size that gives us the largest average fixed subsidy possible. We next turn to data aggregation at the prefectural level and we compute a simple panel model to examine the impact of subsidies on value-added on the agricultural sector. In the second part of the paper we develop a novel, to the best of our knowledge, theoretical model which attempts to explain the interaction between hours worked, land size and subsidies as a choice for each individual farmer to maximize utility, subject to income and production function constraints. This is a partial equilibrium model which we solve for the optimal land size to hours worked ratio in order to examine the marginal impact of taxation and the marginal impact of the rate of increase of subsidy units with respect to this ratio (both being negative). Furthermore we attempt to estimate the relative weight that the average farmer will give to hours worked vs subsidies, as they enter in the utility function. We consider a reliable dataset stemming from the official website of FADN. We first estimate the parameters of the aggregate production function, imposing CRS as in the literature, and then using the first order conditions of the farmer's problem we apply a GMM approach to estimate the relative weight.

RESULTS & DISCUSSION

We present some of our preliminary results. In Table 1, we illustrate the progression of the marginal impact of one additional hectare to subsidies received and the progression of the (here physically meaningful) intercept of the model – the fixed amount that each eligible farmer is getting on average for each land size group. We can clearly see that the results on the whole of the land sizes are essentially similar to explanatory power with those on the 0-15 hectares group but with two significant differences, in terms of the associated intercept and slope numbers. Becoming a bit more particular on the above we can see that the average constant subsidy for all farm sizes has grown from about 1800 euro to 2200 euro from 2008 to 2014, a change of 22%. The absolute amount might be seen small but the percentage change is huge: during the financial crisis Greece has lost about 25% of its real GDP and here we have an uncoupled income transfer to a particular professional group of about the same amount. Furthermore, we see that about 35% to 45% of the subsidies variation rests on land size – a reasonably large proportion given that subsidies are tied to subsidy rights but still considerably small- if one considers that subsidies are completely unrelated to production or productivity. Then, we note that the marginal impact of each additional hectare (again for the group of all farm sizes) is has mildly increased up to 2012 and then dropped in 2014 compared to 2008 – and it's still trivially low to make it meaningful for real world applications.

Table 1. Impact of Farm Size on Subsidies, all years and per farm-size group

Year	Constant	Slope	R²	Land Size Group	Equivalent Hectare
2008	1835,85	176,58	35,62%	Aggregate	29
	297,37	619,7	35.50%	0-15	10
	6916,64	158,73	2,92%	15-50	
2010	1953,68	188,23	42,42%	Aggregate	24
	327,43	585,81	43,40%	0-15	10
	6534,7	183,23	4,35%	15-50	
2012	2057,87	195,62	43,83%	Aggregate	22
	356,16	599,6	44,60%	0-15	10
	6463,46	198,55	4,70%	15-50	
2014	2238,89	158,57	36,82%	Aggregate	22
	308,63	589,49	44,72%	0-15	9,3
	5778,66	243,45	6,51%	15-50	

Table 2. Estimation of the main structural parameters

Parameter	Estimation	Std. Error	P-Value
γ	0,502	0,055	3,62e-012 ***
A	2,226	3,910	> 0,10
σ1	4,849	2,072	0,023 **
ω	0,664	3,545e-05	0,000***

In Table 2 we present the estimation of the main structural parameters of the model, among which the prime interest rests of the γ and the ω ones. The first measures the returns to scale parameter attached in the land size to hours worked ratio, under the assumption that the production function exhibits constant returns to scale. We see that it is estimated to be ½ and thus the average farmer appears to be devoting half-and-half of inputs to the production of the final output. Given the estimates of the other parameters we solve for the ω parameter which measures the utility trade-off between hours worked and subsidies received per hour worked. The estimate is telling us that in the utility function, the average farmer has two equivalent representations: first, he puts a 2/3 weight to hours worked over a 1/3 weight to subsidies per hour worked but in the sense that subsidies are naturally linked to land size this has a 1/3 to 2/3 weighting on hours worked vs land size. So although production has a ½ to ½ share on the returns to scale, the utility has an uneven distribution which naturally leans on land size. This result is clearly supportive of our overall argument that higher lots of cultivated land size are not only more conducive to subsidies but are also of increasing value added in production.

CONCLUSIONS

Greece is a very important case study to consider, because of the fiscal problems that has and is still facing. Our analysis is suggestive on some important positive directions, however, that not only coincides on some stated goals for reshaping the Greek productive structure but also make good economic sense. We find that there is a strong, possibly non-linear, relationship of subsidies to farm size and thus to their contribution to the added value of agricultural production. Thus, because of their redistributive nature, agricultural subsidies do not offer the maximum possible effect on the economy and for small farms and several prefectures can act as a productive disincentive; on the other hand, for larger farms subsidies might be way more useful as the larger farms are those that drive the most of agricultural value-added – and this is a clear signal for using subsidies (e.g. via a competitive market for subsidy rights) as a way to generate increasing returns to scale in agriculture. Our theoretical model and estimation results on it strongly support the above.

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THE IMPACT OF POST-2020 CAP REFORM PROPOSAL ON FARMERS' INCOME AND THE ENVIRONMENT: THE CASE OF GREECE

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ABSTRACT

This paper presents empirical results about the potential impacts of the post-2020 CAP reform on farm income and environmental sustainability in Greece. By using a farm programming model, we simulate four scenarios of different levels of environmental ambition and payment redistribution. We show that the environmental provisions of the new CAP, which are expected to be more ambitious than before, can contribute to environmental sustainability with little cost to farmers adopting additional agri-environmental measures. Finally, higher level of payment redistribution appears to have only a minimal effect on Greek farms because of their small size.

KEYWORDS: agricultural policy, farm model, environmental indicators.

INTRODUCTION

The support of farmers' income is a traditional objective of the European Union's (EU) Common Agricultural Policy (CAP). It is mainly addressed through direct payments schemes (particularly decoupled payments), conditional

on respecting specific environmental standards designed to reduce the environmental footprint of European farming systems and to promote sustainability. Although the agricultural economics literature has traditionally focused on analysing income distributional effects of the CAP, environmental sustainability is a more recent CAP objective which has attracted a lot of interest among agricultural economic policy modellers especially after the 2013 CAP reform and the introduction of the "greening" measures (e.g. Gocht et al., 2017; Louhichi et al. 2017; 2018; Solazzo et al., 2016; Solazzo and Pierangeli, 2016). Despite a large number of studies on the impacts of greening, however, there is significantly less work done (particularly empirical analyses) on what has been recently proposed by the Commission for the post-2020 CAP reform (European Commission, 2018a). The Commission's legislative proposal for the CAP post-2020 provides more flexibility for Member States to tailor their Strategic Plans according to national and local specificities. It gives greater emphasis than before on the equitable distribution of direct payments and is also characterized by higher environmental and climate ambition, proposing a performance-based "delivery" model for payments; financing will depend on the achievement of environmental and climate objectives rather than just compliance with European legislation. With this upcoming reform, CAP is expected to contribute to the fair, healthy and environmentally friendly European food system as set by the European Commission in the European Green Deal and "Farm to Fork" strategy.

This paper attempts to fill this gap in the literature by presenting and discussing empirical results of policy impact analyses for Greece related to the CAP post-2020 proposal. It uses a farm-level mathematical programming model applied to more than 4000 farms in Greece to simulate four policy scenarios, each corresponding to different levels of environmental ambition and payment redistribution, and attempts to answer the following questions: (i) How the reformed CAP contributes to improvement of farmers' income, (ii) How it contributes to environmental sustainability, and (iii) What may be the trade-off between these two objectives.

METHODS

Like the 2013 reform and the introduction of greening, the Commission's proposal for the CAP post-2020 introduces two layers of measures for achieving environmental objectives. The baseline layer is represented by "Enhanced conditionality" which will replace cross-compliance as the new, and more ambitious, minimum set of requirements for receiving Pillar I payments. Member States are also asked to design a set of even more environmentally ambitious measures, referred to as "eco-schemes", which will be voluntary for farmers and will be funded through Pillar I. For this study, we interpret "environmental ambition" as the share of the national Pillar I envelope allocated to eco-schemes. Regarding redistribution, the Commission's proposal recommends that the redistributive payment scheme, which was initially introduced with the 2013 reform as an additional voluntary decoupled payment to smaller farms, now becomes mandatory for all Member States. The capping of payments remains, but the implementation details are left to the discretion of each Member State. We interpret the "level of payment redistribution" according to (i) the share of the national Pillar I envelope allocated to the redistributive payment scheme and (ii) the level of capping. Based on these interpretations, the four policy scenarios examined are presented in Table 1.

Table 1. Scenario specifications

	High payment redistribution	**Low payment redistribution**
High environmental ambition	(*HiENV_HiRED*) • 40% of national envelope for eco-schemes • 10% of national envelope for redistributive payments • Capping at 60,000 euros	(*HiENV_LoRED*) • 40% of national envelope for eco-schemes • 5% of national envelope redistributive payments • Capping at 100,000 euros
Low environmental ambition	(*LoENV_HiRED*) • 10% of national envelope to eco-schemes • 10% of national envelope for redistributive payments • Capping at 60,000 euros	(*LoENV_LoRED*) • 10% of national envelope for eco-schemes • 5% of national envelope for redistributive payments • Capping at 100,000 euros

All four scenarios assume the same Pillar I envelope and the same envelope for Voluntary Coupled Support payments (VCS). The Basic Payment Scheme for each scenario is different, however, and it calculated as a residual of the total Pillar I envelope after removing the share allocated to eco-schemes, redistributive payment, VCS and a 2% for young farmers.

The model used in this study is the IFM-CAP model (Louhichi et al., 2018). IFM-CAP is a farm-level positive mathematical programming model designed for economic and environmental analysis of the European agricultural sector. It includes more than 50 crop and animal activities and uses farm data from the Farm Accountancy Data Network (FADN) which allow it to capture the heterogeneity of European farming systems. The model is applied to each individual farm and assumes that farmers maximize the expected utility of their income subject to resource and policy constraints. A post-solution module also allows the model to estimate the impacts of the different policy scenarios on environmental sustainability using specific environmental indicators measuring crop diversity (Shannon index and reciprocal Simpson's index), input expenditures per hectare and cropping management factors related to erosion (Westbury et al., 2011; Panagos et al., 2015).

The specific environmental measures in each scenario that fall under enhanced conditionality and eco-schemes are presented in Table 2. Since, by the time of writing this paper, the final details of the CAP reform had not yet been decided by either the Commission or the individual Member States, the selected measures represent the best available estimate and draw on the measures that were modelled in the impact assessment exercise which accompanied the Commission's legislative proposal (European Commission, 2018b).

Table 2. Agri-environmental measures modelled

Enhanced conditionality (mandatory for all farms)	Ratio of grassland to Utilized Agricultural Area (*maximum 5% decrease*)
	Change of environmentally valuable permanent grassland and Natura 2000 grasslands (*0% - no change allowed*)
	Utilized Agricultural Area with fallow land, landscape features and buffer strips (*applied to 3% of Utilized Agricultural Area*)
	Crop rotation (2 years)
Eco-schemes (voluntary for farms)	Winter soil cover (winter crop, catch crops, no tillage) (*applied to 75% of arable crop area*)
	Permanent cover crop between tree rows (applied to *50% of permanent crop area*)
	Crop rotation (3 years)
	Additional arable land lying fallow or with Nitrogen Fixing Crops (*applied to 3% of arable land*)

The simulation results of all scenarios are compared with a reference, or "baseline" scenario which represents a mid-term projection of the European farming sector under the current policy setting. The baseline and the four scenarios assume the same Pillar I budget and similar VCS payments. The baseline of IFM-CAP is created by applying price and yield trends for 2030 taken from the CAPRI model. These trends are based on a set of plausible assumptions about macroeconomic and other variables of interest and are consistent with the European Commission's annual baseline projections of agricultural commodity markets.

RESULTS AND DISCUSSION

In terms of agricultural production, all four scenarios lead to a decrease in land allocated to cotton and vegetable crops compared to the baseline, and to an increase in set-aside and certain cereals like barley, soft wheat, and maize. As expected, animal production is not directly affected by the adoption of eco-schemes. Simulation results show that, although all scenarios bring about environmental benefits compared to the baseline, these benefits are slightly higher in scenarios positing higher environmental ambition for which the adoption rate of

eco-schemes reaches 88% of all farms modelled. Adoption of eco-schemes in scenarios with low environmental ambition does not surpass 58%.

All policy scenarios lead to a small reduction of farm income compared to the baseline of around 7% on average for the low environmental ambition scenarios and 8% for the high environmental ambition scenarios. However, the income effects are very heterogeneous among farms and farm types, but low environmental ambition systematically leads to higher incomes compared to higher environmental ambition scenarios. The main explanation for these findings is that the increased share of the CAP budget devoted to financing the adoption of eco-schemes in high environmental ambition scenarios may lead to more substantial income changes for non-adopting farmers. The reason is that the costs of adoption may offset any subsidy gain, preventing farmers from adopting eco-schemes. As a result, non-adopters lose the payments linked to eco-schemes which they received in the pre-reform period in other forms (e.g. BPS) and with less stringent environmental requirements. On the contrary, the income effects of redistribution are rather small. This can be explained by the structure of the farm sector in Greece that mainly consists of small farms, the majority of which is not subject to payment reduction from capping.

CONCLUSIONS

This paper presents empirical results about the potential impacts of the upcoming CAP reform in Greece. We show that the provisions of the new CAP, as modelled herein, may be beneficial for the environment albeit at some cost to farmers. Our results depend greatly on the modelling choices made, especially as regards the budget shares allocated to eco-schemes, the individual agri-environmental measures modelled, and the environmental indicators provided. Further research is needed to assess more accurately the impact of the reformed CAP on European farming systems when the Strategic Plans of all Member State have been finalized.

DISCLAIMER

The views expressed in this article are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.

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THE POLICY OF AGROTOURISM AND THE PROMOTION OF SUSTAINABLE DEVELOPMENT VIA SOCIAL MEDIA

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ABSTRACT

The best tactic of finding a solution to the problems of sustainable development and its development is to understand the existing policy of agrotourism and to observe the needs of those involved. This assumption is also the main objective of this work. The method followed is the in-depth study of the articles Designing a regional policy of agrotourism and Urban and rural destinations on Instagram: Exploring the influencers' role in sustainable tourism. The articles mainly use primary data (interviews) and minimal secondary data which will be analyzed in the section "Methods". This study includes an analysis of key tools for interpreting agrotourism activity such as density, complementarity of agrotourism with other activities, its integration, networking and control and other innovative concepts of the image of the tourist landscape. Agrotourism will be studied as a service provider, the importance of the position of farmers in the model of territorial strategy and therefore the categories they create. The focus will then be on the agrotourism networks and in detail on their typology and their importance. In more detail, we will focus on the organization and policy of networks in France. France uses institutions and agricultural chambers to structure agrotourism. The conclusions of the Modintour program, which studied the components influencing the choice of an agrotourism landscape and the Nattitude program, which carried out the project to shift the responsibility of agrotourism to the wider tourism sector, will be analyzed. It will also study the role of hashtags and influencers in promoting agrotourism and sustainable development. For the promotion and development of agrotourism, it is important to study what affects tourists in their choice. Others consider it to be the destination while others today marketing and social media.

KEYWORDS: networks, policy, sustainable development, hashtag, influencer.

NEXUS ISSUES, RESILIENCE CONCERNS AND POST-EXCEPTIONALISM IN BIOECONOMY POLICIES – A QUALITATIVE COMPARATIVE ANALYSIS OF BIO-ECONOMY STRATEGIES AND THEIR DESIGN SPACES

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ABSTRACT

Policies to promote the transition from carbon-based to bio-based economies are proliferating around the globe, epitomized in the sprawling adoption of bio-economy strategies in more than 50 countries worldwide. Many bio-economy policies give a prominent role to agricultural products and producers, often reproducing narratives and frames that have long been established in agricultural policy. We hypothesize that bio-economy policies carry over a policy legacy through which a post-exceptional agricultural policy paradigm spills over into the broader realm of bio-economy policies. At the same time, the emerging bio-economy creates strong interlinkages between agricultural, food, energy, environmental, climate and economic policies, calling for coordinated nexus governance. The nexus issues in the bio-economy in turn raise concerns about the resilience of the bio-based production systems on which the bio-economies rest. This raises three important questions: Are the

interconnections across domains articulated in bio-economy policies? How are resilience issues addressed? And how is this affected by the design space in which bio-economy policies are formulated?

To answer these questions, we have coded policy problematizations, goals, and instruments in the bio-economy strategy documents of 51 countries and employed principal component analysis to assess the resilience orientation of the bio-economy strategies and the presence of agricultural (post-) exceptionalism. We then identify configurations of social, political, economic and ecological conditions to characterize policy design spaces which vary in openness and inclusiveness. Finally, we deploy fuzzy-set QCA to explain which characteristics of design spaces affect the active consideration of different resilience concerns and nexus issues and/or the presence of agricultural (post-)exceptionalism.

The paper contributes to a better understanding of the presence of agricultural post-exceptionalism in bio-economy policies. In addition, it assesses to what degree resilience concerns in bio-economy policies transcend productivist policy legacies and move towards more integrative nexus governance. Finally, it points to the ambiguous role of resilience concepts, which can foster adaptive nexus governance but also privilege producers in the bio-economy. The research presented is part of the research project Policy Designs for Resilient Bioeconomies (PolDeRBio), which is funded by the German Federal Ministry of Education and Research (BMBF).

A FARM MODELLING APPROACH TO EVALUATE THE ABOLISHMENT OF THE CAP HISTORICAL MODEL AFTER 2020: THE CASE OF GREECE

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ABSTRACT

Within the context of the proposed after-2020 CAP strategic planning, the paper utilizes a farm model to evaluate the abolishment of the historical model in Greece and the immediate establishment of a single flat rate payment.

KEYWORDS: farm model, CAP, Greece, historical model.

INTRODUCTION

The European Union's Common Agricultural Policy (CAP) is heading towards another reform according to the Commission's proposal published on June 2018 (European Commission, COM (2018) 392 final). Each MS will establish a single 'CAP strategic plan' encompassing interventions for both Pillar I (direct payments) and Pillar II (rural development). The preparation of the plan shall be based on quantitative and qualitative up-to-date information that provide a thorough assessment of the current situation; it shall actively involve all related economic and social partners; and it shall be connected to a set of common at the EU level economic and biophysical indicators defined in the Regulation. At the end, the strategic plans will be submitted to the Commission for approval.

Within this strategic planning context, the paper utilizes a farm model to ex ante evaluate the abolishment of the historical model in Greece and the immediate establishment of a single flat rate payment.

More specifically, in the 2003 Fischler reform, Greece initially followed the historical model and with the advent of the 2013 CAP, it opted for partial convergence applied at regional level. At 2019, due to the further convergence, no unit value will be lower than 60% of the regional target flat-rate and the unit values that exceed 100% of the regional average will have been reduced to compensate for the increase of the unit values below 90% of the average.

Thus, by the end of the current CAP the distribution of unit values will be less skewed and the option of applying a flat rate payment either in the country level or in regional level becomes politically feasible.

Furthermore, the measure of redistribution of income support from bigger to medium and small sized farms, as prescribed in the CAP, can be used to compensate for any negative effect to small farms.

Within the strategic planning context and the policy challenge of abolishing the historical regime in Greece, a quantitative bottom-up modelling approach is implemented to provide evidence for answering the following questions: What will be the effect to the income of different types of farming and farm economic sizes? Are there any production adjustment effects? What environmental consequences are expected? How policy makers can use the intervention of redistributive payment to reverse negative income effects to small farms?

METHODS

We use a farm modeling approach to simulate the effects of the abolishment of the historical model. There are two advantages of using farm models to evaluate CAP's decoupled payments regime. First, due to CAP environmental concerns, decoupled payments impose some relevant limitations in the farm level production (e.g. greening, enhanced conditionality, etc.) which can be simulated by the farm model (Galán-Martín et .al, 2015; Solazzo et al., 2016). Second, a growing body of literature has emerged which examines how decoupled payments may affect production choices through other channels, not related to direct environmental constraints[1].

GREFAM model (Kremmydas et al. 2018), assumes that farms select an activity plan to maximize total gross margin (eq. 1). Vector c^T contains the activities' gross margins and x is the vector of the decision variables (areas of crops in ha, number of livestock heads). Farms are also subject to certain constraints (eq. 2) where the matrix A contains the resource requirements per unit of an activity and the vector b represents the resource availability. The following constraints were explicitly taken into consideration: total land availability; irrigated land; labor availability; working capital constraint; permanent crop; livestock; crop rotations; as well as flexibility constraints such as existence of contract crops.

$$\max c^T x \tag{1}$$

$$s.t\, Ax \leq b \tag{2}$$

It is a linear model, using the 2016 Greek FADN data. It models all arable, vegetable and permanent crops and a major part of the grazing livestock (sheep and goats), adapted to Greece.

RESULTS AND DISCUSSION

We are modeling six scenarios, as described in the following table.

Table 1. Scenario simulations

Name	Flat rate implementation	Redistribution
Scenario 1-r0	Flat rate in country level	No redistribution
Scenario 1-rL		10% of budget to farms with less than 2 hectares
Scenario 1-rH		20% of budget to farms with less than 2 hectares
Scenario 2-r0	Flat rate in agronomic regions	No redistribution
Scenario 2-rL		10% of budget to farms with less than 2 hectares
Scenario 2-rH		20% of budget to farms with less than 2 hectares

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1. Moro and Sckokai (2013) have written a review on the issue; Hennessy (1998) has identified the wealth effects and the insurance effects; O'Neill and Hanrahan (2016), Caian et al. (2018) and Graubner (2018) discuss the capitaliation of the decoupled payments on land prices; Martinez Cillero et al. (2017) examine the relation of decoupled payments and technical efficiency, through the channel of investments; Rizov et al. (2013) and Hailu and Poon (2017) examine the link between decoupled payments and farms' productivity

We will present preliminary results of simulations regarding the distribution of income effects across farm types and economic sizes, the production effects (irrigated areas, fallow land), the income effects specific to small farms and the reduction of payments in relation to the baseyear situation (the FADN data). We will also provide insights regarding the possible effect of the scenarios on the land size distribution of farms, using the shadow prices of the land constraint.

CONCLUSIONS

We are simulating the abolishment of historical payments in Greece within the new strategic planning context of CAP. However, the scope of the paper is wider as the research question is relevant to the CAP planning of all Mediterranean countries that originally had a very diverse distribution of payments per hectare across farms. The political stress to maintain this distribution intact led all those countries to adopt the historical model for the 2005-2013 Fischler reform and afterwards to opt out for partial convergence in the current CAP 2014-2020 regime (Henke et al., 2015).

Since the uniformity of the payments per hectare represents one of the core elements of a political agreement in the EU, the policy question of a uniform payment per hectare will possibly arise for Mediterranean countries. The usage of the model results can potentially facilitate the discussion between stakeholders.

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  [ID: 202149] What's the importance of adopting smart farming technologies aiming for sustainable rural development? An empirical study
- **Piotr Jurga, Efstratios Loizou & Stelios Rozakis**
  [ID: 202146] Agricultural biogas impact assessment employing input output modelling

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INNOVATION AND SUSTAINABILITY IN RURAL HOUSEHOLDS: TOWARDS A THEORETICAL FRAMEWORK

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ABSTRACT

The main research question of this theoritical framework is how the interactions between farmers and other change agents in farmers' communication networks affect their behavior towards the adoption of agricultural innovations, the embeddeddness of new knowledge and the sustainability of their farms. The objective is to measure and examine the relationship between innovation and the sustainability of farmers and, by extension, rural households, the social capital of them, and how this affects "deepening", "broadening" and "regrounding" their productive activities. The case study of this research will be the members of a network-cooperative-producer group which is based on an island, as the relationship between social capital, cooperative and social enterprise has been less investigated and also that assessments of the "quantity" and "quality" of social capital are missing on islands. The empirical research will be conducted through personal and in-depth interviews with the producers of the network-cooperative-producer group. For the research needs a questionnaire will be prepared. The methodology will include both quantitative and qualitative methods. Quantitative data will be analyzed to measure innovation, sustainability and social capital by selecting appropriate variables and indicators. The expected results will lead to provide new scientific directions and suggestions for the dissemination of information, knowledge and innovation.

KEYWORDS: innovation, sustainability, social capital, networks, islands.

INTRODUCTION

The idea of networking in innovation suggests that the farmers' position in social networks determines their access to resources needed to implement the innovation (Hartwich & Scheidegger: 2010). We argue here that studying the dynamics of networking contributes to a better understanding how and when smallholder farmers make decisions to adopt innovations. Ierapetritis (2019) point out that within a network at least some members are able to affect the creative innovative activities of the entire network. In the same logic OECD (2009: 17) explain that "*being part of a group is positively correlated with the probability of being innovative…cooperation is very strong correlated with innovation*". Also, the OECD/Eurostat (2018) innovation indicators show that firms, in our analysis agricultural cooperatives and their members, that are active in the international markets are more likely to be innovative, and vice versa. Evaluation of network spatial linkages is essential because of the importance of knowledge flows among cooperatives and other organisations for the development and diffusion of innovations. This fact helps understand the necessity of social capital for the promotion of the innovative ability of a network as each member of the network can have a high individual ability to create innovation (Ierapetritis, 2019). Van der Ploeg and Renting (2004, 235–6) recognise three "pathways" that rural households can use to increase the multifunctionality of their farms: "broadening", "deepening" and "regrounding" of "conventional" productive activities and probably the sustainability of their farms. The relationship between innovation and sustainability of farmers and, by extension, rural households, the social capital of them, and how this affects "deepening", "broadening" and "regrounding" of their productive activities is the objective of this framework.

TOWARDS A THEORETICAL FRAMEWORK

Innovation should not be viewed as a goal, but as a process involving more and more actors (Westlund & Larson, 2016). According to the OECD/Eurostat (2005), innovation can be distinguished in four complementary types: product innovation, process innovation, marketing innovation and organisational innovation (figure 1). Social innovation refers to a social process of innovation – a process where the creation of 'novelties' (new products, technology and knowledge) is based on the collaboration of different social groups, that crosscut traditional borders. Innovations are also referred to as social innovation when the novel products and practices respond to public needs and demands (EU SCAR, 2012). Across the globe, smallholder farmers confront major challenges that result in their low levels of innovation, with factors such as low access to technology, entry barriers, coordination difficulties, asymmetry in information flows, and high exposure to natural shocks. Peripheral regions are regarded as less innovative because of their lack of human capital and innovation attitudes. *Important drivers of innovation are absent because of their "organisational thinness" and lack of dynamic clusters and support organisations and because of their distance to other regions and external knowledge* (Tödtling & Trippl 2005: 1208).

Social capital is a concept that has been defined in many different ways and has been considered more theoretically with applications to a number of different phenomena (among others Iosifides et al., 2007; Jones et al., 2009; Kizos et al., 2018; Kizos et al., 2014; Lyon, 2000) and less empirically (e.g. Charatsari et al., 2016 in farmer field schools; Koutsou et al., 2014 to young farmers; Jones et al., 2012; Jones et al., 2008; Trigkas et al. 2020). Despite the position of farmer cooperatives in markets and awareness about their social capital based characteristics, the definition and measurement of social capital in farmer cooperatives have not yet been broadly investigated, and there is little empirical evidence to support the concept in these organizations. Social capital has been widely investigated in corporate studies but not yet in studies of cooperatives and social entrepreneurships (Liang et al., 2015; Borzaga & Sforzi, 2014). Social capital of smallholder farmers may be effectively used to enhance innovation by building upon existing resources (communication pathways), enhancing social learning (farmers learning from farmers), and foster interpersonal and community trust (Saint Ville, 2013).

Recently, Pisani et al. (2017) develop a methological framework for social capital and its relationship with the local development of rural areas, for this study the framework presented at figure 1 investigate the relationship with sustainability of rural households. Therefore, Christoforou & Pisani (2016) underline the capacity of social network analysis to depict the main structural features of social capital and the efficiency of information flows within the network in order to achieve better economic performance and by extension, sustainability. Mapping and graphically depicting nodes and links between nodes has been used recently to display network qualities,

such as the appearance (or not) of important actors and the density of links (Hidalgo et al., 2015). But while there are many such studies concerning other sectors e.g. social media, tourism (e.g. Booyens & Rogerson, 2017), and agritourism (Karampela et al., 2019), there are few for formal farmer networks (e.g. Makri & Koutsouris, 2015; Faysse et al., 2012; Monge et al., 2008).

As figure 1 showed the starting point for this research was the observation that networks, cooperation and collaboration have become associated with many benefits in rural development, including the facilitation of knowledge exchange between participants-actors. An example of network is agricultural cooperatives where the interactions between their members-farmers and by extension rural households affect their behavior towards all types of innovation adoption and innovation activities, the embeddeddness of new knowledge and the sustainability of their farms. Also, the different types of networks are considered important sources of social capital (e.g. family, circles of friendship and acquaintance, professional and business networks, voluntary associations, etc.) and the types of relationship that matter the most (e.g. bonding/bridging/linking, strong vs weak ties, etc., see also Bourdieu, 1986; Monge et al., 2008; Putnam, 2000).
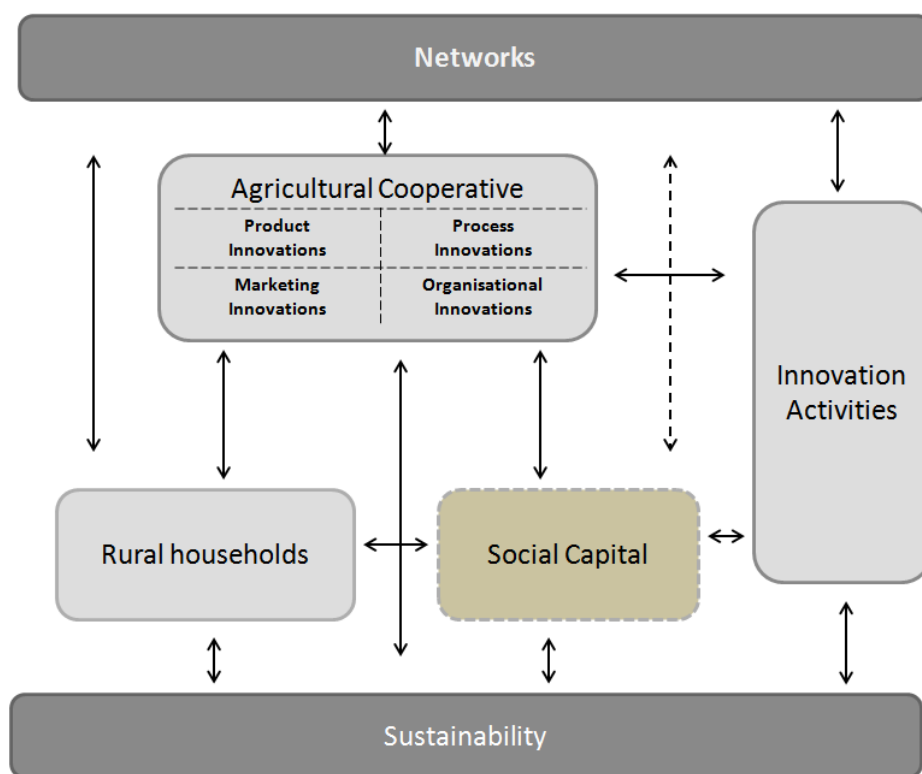
Figure 1. Theoritical framework

Source: the authors

CONCLUSIONS

The case study of this research will be the members and the rural households of a network-cooperative-producer group which is based on an island, the United Winemaking Agricultural Cooperative of Samos (UWC SAMOS), as Borzaga and Sforzi (2014) point out that the relationship between social capital, cooperative and social enterprise has been less investigated and also Karampela et al. (2017) in the meta-analysis of the literature on the Aegean islands underline that assessments of the "quantity" and "quality" of social capital are missing. The empirical research will be conducted through personal and in-depth interviews with the producers of the network-cooperative-producer group. For the research needs a questionnaire will be prepared. The methodology will include both quantitative and qualitative methods. Quantitative data will be analyzed to measure innovation, sustainability and social capital by selecting appropriate variables and

indicators. Different research methods will be used: social network analysis, spatial analysis, qualitative and quantitative data analysis.

This work will significantly contribute to the deepening of knowledge, the development and promotion of new and innovative methods and tools for participants of networks as knowledge and innovation bodies. As Todtling & Trippl (2005) argue the analysis of the main innovation barriers in different types of problem regions has clearly shown that there is no single "best practice" innovation and sustainability activities applicable everywhere, instead a "tailor-made" policy approach has to be adapted addressing the specific challenges, problems and opportunities found in each type of region. The assessment of current conditions for the state of networking and the identification of gaps in existing knowledge will guide the collection of useful data. The methodological approach and tools that will be developed could be used to support decision-making for the effective management of networks. Moreover, by achieving substantial growth of knowledge through the analysis that will be applied will contribute to a deeper understanding on the measurement of social capital, social innovation and sustainability and their role in networks. The results in terms of "dense" and "non dense" social relations will allow to formulate policy recommendations, which aim at increasing medium and long term level of trust and cooperation among network members, the innovation and the sustainability of rural households by exploring the creation of new products and services related or not to agriculture. The expected results will lead to provide new scientific directions and suggestions for the dissemination of information, knowledge and innovation useful not only to the scientific community but also to policy makers and the general public.

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A DEA MODEL FOR SUSTAINABLE MANAGEMENT OF AGRICULTURAL REGIONS

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ABSTRACT

In this study a window-Data Envelopment Analysis (window-DEA) model was implemented in order to estimate the relative agricultural economic and environmental efficiency of agricultural production. Two scenarios was used for sustainable management of agricultural resources. In the first scenario (S1) only economic efficiency was taken into account, measured by the output of gross margin. Additionally in the second scenario (S1) also environmental sustainability targets was integrated in the model, expressed by the output of bioenergy from agricultural derivates in order to test the input minimization scheme under altered model assumptions. The two scenarios are compared according to their capability of improving the use of agricultural inputs. The survey is conducted in seven regional units of Central Macedonia region located in Northern Greece. These regional units are the decision making units (DMUs) in the model used. The present study is an attempt to explore ways for improvement in efficiency and resource allocation.

KEYWORDS: relative efficiency, data envelopment analysis, window-DEA, sustainable agriculture.

INTRODUCTION

The sustainable agricultural management of rural areas requires the consideration of a wide range of interconnected dimensions of sustainability: environmental, social and economic. Agriculture is considered essential for sustainable development and the sustainability development goal 2 (SDG) is referred to promotion of sustainable agriculture through SDG target 2.4.1 that includes the implementation of sustainable agricultural practices. The inputs are the same in both scenarios: variable cost, land, labour, fertilizers and tractors. The two scenarios are differentiated in the outputs used. In S1 the output is only the gross margin, as a measure of profit and in S2 the bioenergy production, from agricultural residues is proposed as additional second output as a step for sustainable agriculture, less carbon emissions from burning of residues in the field, additional income for farmers from its utilization and possible energy self-sufficiency of agricultural areas. The results from the two scenarios are compared and the improved management of inputs suggested in both cases.

METHODS

The window-DEA model (Charnes et al, 1985, Cooper et al, 2011) was performed for 2010-2015 time period covering six years, in 3 windows of 4 year length each. The window-DEA is proved quite useful methodological approach and is preferred over other competing techniques, because it allows the decision maker to address the problem of low efficiency discrimination by increasing the observations (DMUs) from 7 to 28. In S1 five inputs and one output are used in order to estimate the technical efficiency (TE), the pure technical efficiency (PTE) and the scale efficiency (SE) of each prefecture. In order to integrate the sustainability factor in the analysis an output-target for minimization of environmental footprint, is added in S2.

RESULTS AND DISCUSSION

Table 1 presents the mean efficiency scores of TE, PTE, SE for each window from w_1 to w_3. Table 2 presents the optimized deviations of 5 inputs (variable cost, land, labour, fertilizers and tractors used) considered based on average efficiency values from window analysis between scenario S1 and scenario S2.

Table 1. Efficiency scores and decomposition of TIE in PTIE and SIE (Scenario 1 and Scenario 2)

DMU		Imathia			Thessaloniki			Pieria			Kilkis			Pella			Serres			Chalkidiki		
Efficiency		TE	PTE	SE	TE	PTE	SE	TE	PTE	SE	TE	PTE	SE	TE	PTE	SE	TE	PTE	SE	TE	PTE	SE
S1	eff. avg	0.817	0.904	0.903	0.796	0.830	0.959	0.787	0.997	0.790	0.812	0.994	0.817	0.780	0.869	0.897	0.753	0.777	0.969	0.840	1	0.840
S2	eff. avg	0.971	0.987	0.983	0.976	0.982	0.994	0.904	0.998	0.906	0.998	0.999	0.999	0.962	0.984	0.978	0.993	0.995	0.998	0.958	1	0.958
Inefficiency		TIE	PTIE	SIE	TIE	PTIE	SIE	TIE	PTIE	SIE	TIE	PTIE	SIE	TIE	PTIE	SIE	TIE	PTIE	SIE	TIE	PTIE	SIE
S1	ineff. %	18.3%	9.6%	9.7%	20.4%	17.0%	4.1%	21.3%	0.3%	21.0%	18.8%	0.6%	18.3%	22.0%	13.1%	10.3%	24.7%	22.3%	3.1%	16.0%	0.0%	16.0%
S2	ineff. %	2.9%	1.3%	1.7%	2.4%	1.8%	0.6%	9.6%	0.2%	9.4%	0.2%	0.1%	0.1%	3.8%	1.6%	2.2%	0.7%	0.5%	0.2%	4.2%	0.0%	4.2%

Table 2. Potential improvement of agricultural inputs (Scenario 1 and Scenario 2)

DMUs	Improvement of agricultural inputs in %									
	INPUT 1		INPUT 2		INPUT 3		INPUT 4		INPUT 5	
	Variable Cost (euro)		Land (hectares)		Labour (hours)		Fertilizers (kgrs)		Tractors (number)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2	Scenario 1	Scenario 2	Scenario 1	Scenario 2	Scenario 1	Scenario 2
Imathia	-18.5%	-6.3%	-18.0%	5.7%	-18.3%	-10.0%	-19.2%	-6.5%	-25.4%	17.3%
Thessaloniki	-32.9%	-16.7%	-21.4%	-10.0%	-21.8%	-12.3%	-26.9%	-15.2%	-42.4%	-13.2%
Pieria	-18.5%	-4.5%	-40.0%	-1.7%	-20.0%	-8.9%	-20.9%	-1.4%	-48.2%	-36.3%
Kilkis	-18.8%	7.2%	-19.8%	2.3%	-18.3%	-1.1%	-19.0%	0.2%	-22.7%	-2.9%
Pella	-21.2%	-9.7%	-22.7%	-3.4%	-23.1%	-20.4%	-22.7%	-10.5%	-27.6%	-19.4%
Serres	-24.0%	4.4%	-23.6%	30.3%	-24.5%	-3.6%	-25.2%	15.4%	-47.1%	-17.9%
Chalkidiki	-15.6%	-0.9%	-17.6%	-11.9%	-16.3%	-14.0%	-16.3%	-5.9%	-17.3%	-16.1%

Concerning the similarities of the two scenarios, it is observed that TE and PTE mean efficiency scores in 3 windows are less than one and the prefectures have substantial degree of technical inefficiency (TIE). Focusing on efficiency results, the small variation of efficiency scores among prefectures compared and the fact that the scores are considerably high, is an indication of significant similarities regarding the structural characteristics of their agricultural production practices, similar crops cultivations, weather conditions, subsidy schemes etc.

The study suggests that for all prefectures there is room for further performance improvement if they readjust they production scale and select a correct configuration of inputs/outputs. Especially, scale inefficiencies (SIE) due to incorrect scale of production are dominant in Imathia, Pieria, Chalkidiki, Kilkis and Pella in both scenarios. Purely technical inefficiencies (PTIE) attributed mainly to inappropriate management practices in organizing agricultural inputs are observed in Thessaloniki, Serres and Imathia in both scenarios

Concerning the differences between S1 and S2, it is evident that the integration in the analysis of the second output in S2 has as a result smaller potential improvement of agricultural inputs. The conflicting nature of two aspects economic and environmental is obvious, from the high deviation of projected improvement of agricultural

inputs use. In all cases the divergence from existing inputs values are higher in S1 compared to S2. If the desire of producer or decision maker is environmental sustainability also, then the saving of inputs will be less than expected from economic point of view.

CONCLUSIONS

The suggested scenarios allows the separation of efficient from inefficient production units and calculation of input quantities used in a wasteful way. An effort was made to project optimal combination of inputs as a step towards the better resource management. This study tried to incorporate in agricultural modelling the minimization of environmental footprint by including into farmers preferences also sustainable management practices, like utilization of bioenergy from biomass residues in a productive way and reduction of carbon emissions, instead of just burning them in the field as a waste.

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TECHNICAL EFFICIENCY OF CEREALS' CULTIVATION IN GREECE

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ABSTRACT

Cereals is one of the main crops not only in Greece, but also in Europe, with significant economic impact. In this research, we aim to capture the current situation in cereal production in Greece. We investigate the Technical Efficiency (TE) of Greek farms, as well as the factors that could affect it. TE depicts the productivity levels of Greek farmers, i.e. how efficiently they use their inputs. For data calculations, it was selected Data Envelopment Analysis (DEA), which is a nonparametric method in operations research and economics that estimates the production frontiers. Initial results show that cereal farmers in Greece use their sources quite efficiently, while further research could potentially use a larger sample or a specific crop.

KEYWORDS: cereals, agricultural production, technical efficiency, DEA analysis

INTRODUCTION

According to Eurostat, in 2018 the cereal production (including rice) in the EU was 295.1 million tons (about 11.3% of global production), reduced about 4.8% (14.9 million tons) since 2017. On top of EU's countries in cereal production is France followed by Germany, Romania and Poland. Cereals is one of the main crops in Greece (USDA, 2017). Regarding cereal production in this country, Eurostat reports that the agricultural production in cereals in 2018 was about 3 million tons, amounting to 1% of the total European production of EU-28.

Focusing on prices, the average price of Europe's cereals in 2018 increased by 7.9% in a year, not only because of supply issues, but also because of drought. Nevertheless, real terms cereals prices in 2018 remained 10-25%

lower than the peak price levels in 2012. Based on Eurostat reports, in 2019, the value of Greek crop output was about 7,500 million euros, 3.4% of the total value of European crop output of EU-28.

METHODS

The farms, included in the sample, were chosen according to their species of crop, as the main research interest is cereals (rice excluded). In 2016, the Farm accountancy data network (RICA) conducted a survey on a random sample located in Greece. From this survey, the sub-sample related to cereal production was extracted, resulting in a final sample of 33 farmers. Some of the available variables that were taken into consideration are: farm production (in euros), age of the farmers (years), land size (stremma), percentage (%) of land owned by the farmers, subsidy (in euros) and economic size of the farm (ESU - European Size Unit, a standard gross margin of EUR 1,200).

DEA was selected to calculate efficiency scores, using linear models. In general, DEA computes an efficiency score for each decision-making unit (DMU) as suggested by Farrell (1957). The DEA Linear Programs CRS (constant returns to scale) and VRS (variable returns to scale) will be applied on data from cereal farmers in Greece. Coelli (1996) suggested a Data Envelopment Analysis computer Program (DEAP), which will be used for the calculations in this paper.

An extension of basic DEA models as described above (CRS and VRS) is employed for the investigation of the relationship between farm/farmer characteristics and, separately, the computed constant returns to scale TE and variable returns to scale TE. This is known in the literature as "second step" estimation (Bravo-Utera and Pinheiro, 1997; Coelli et al., 1998). The models for CCR TE and BCC TE are estimated separately using the two-limit Tobit model, given that the efficiency scores are bounded between 0 and 100 (Bravo-Utera and Pinheiro, 1997).

RESULTS AND DISCUSSION

This research presents measures of TE for a sample of 33 cereal farmers in Greece. DEA techniques were used to estimate the production frontier, which is the basis for deriving farm level TE measures. The analysis revealed average TE levels of 0.767 for CCR constant returns to scale (Figure 1), and 0.841 for BCC variable returns to scale models (Figure 2), respectively. The result of 22 farms on the increasing returns to scale (IRS) portion of the VRS suggests that, if DMUs have an increase in all of their inputs, there will be a greater than proportionate increase in their outputs, assuming they are technically efficient. Therefore, such analysis helps experts to improve efficiency and increase productivity. The results also highlight the small number of farms with low TE, as 3 farms out of 33 showed TE<0.39 for CRS and 0 out of 33 for VRS. In other words, for the farms with TE=<0.39, this means a production =< of 39% of their potential output levels. Additionally, there is a considerable number of decision-making units (DMUs) - 7/33 for CRS and 11/33 for VRS - that have reached the frontier of perfect operating units (TE=1).

In the second step analysis, the relationship between TE and four attributes of the farm and farmer were examined. The second step analysis relied on two-limit Tobit regression techniques to estimate two separate equations. It was found that the subsidy has a statistically significant negative association to TE ($p<0.05$), while economic size has a statistically significant positive association to TE (Table 1,2).
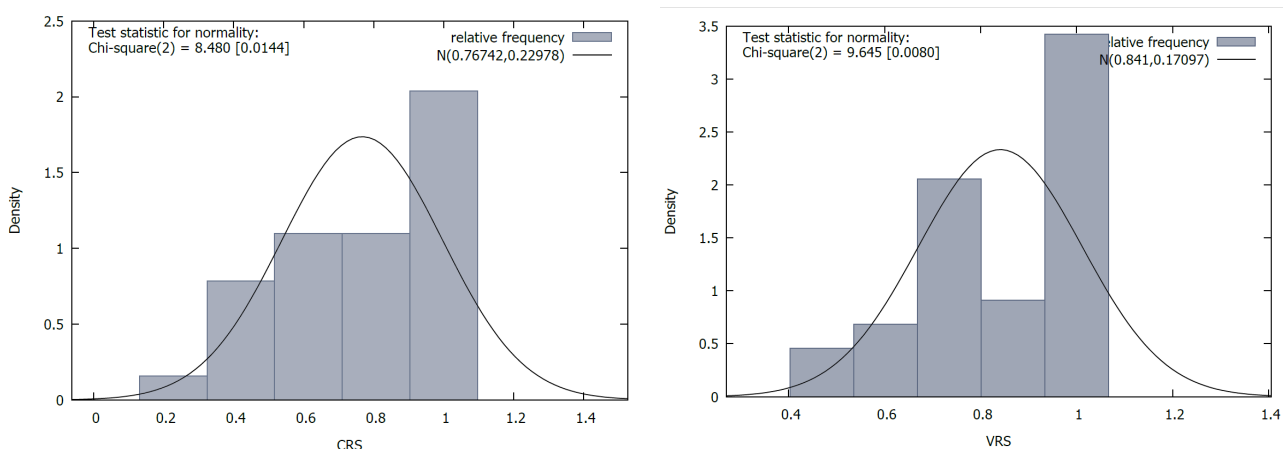

Figure 1. Frequency distribution of CRS results Figure 2. Frequency distribution of VRS results

Table 1. Tobit technique with dependent variable: CRS

		Model 2: Tobit, using observations 1-33 Dependent variable: VRS Standard errors based on Hessian			
	Coefficient	Std. Error	z	p-value	
const	0,990878	0,124615	7,952	1,84e-015	***
age	−0,00284857	0,00170522	−1,671	0,0948	*
ownland	0,0914630	0,0915885	0,9986	0,3180	
subsidy	−1,31289e-05	3,66566e-06	−3,582	0,0003	***
econ size	0,00390345	0,00242142	1,612	0,1070	

Table 2. Tobit technique with dependent variable: VRS

		Model 2: Tobit, using observations 1-33 Dependent variable: VRS Standard errors based on Hessian			
	Coefficient	Std. Error	z	p-value	
const	0,990878	0,124615	7,952	1,84e-015	***
age	−0,00284857	0,00170522	−1,671	0,0948	*
ownland	0,0914630	0,0915885	0,9986	0,3180	
subsidy	−1,31289e-05	3,66566e-06	−3,582	0,0003	***
econ size	0,00390345	0,00242142	1,612	0,1070	

CONCLUSIONS

An important conclusion stemming from this analysis is that a farm with a large economic size seems to use the resources more efficiently for higher production, as it makes better use of economies of scale. Finally, a higher number of subsidies seems to demotivate the farmers from setting higher production goals, supporting the hypothesis that subsidies do not contribute to increased productivity.

The findings reported in this paper should be interpreted with caution. The model used in the analysis does not incorporate several factors that might influence efficiency such as risk, market imperfections or cash constraints. Finally, based on the sample size, additional methodological and empirical efforts would be needed to improve our understanding of the determinants of the efficiency indicators.

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"WHAT'S THE IMPORTANCE OF ADOPTING SMART FARMING TECHNOLOGIES AIMING FOR SUSTAINABLE RURAL DEVELOPMENT? - AN EMPIRICAL STUDY"

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ABSTRACT

Sustainable management in Agricultural Systems is crucial for rural development and the research on Smart Farming Technologies (SFT) seems to be advancing towards that direction. The methods of Smart Farming are oriented towards adaptation and building resilience to climate change and also focus on improving the use of natural resources and positively assessing the input-output balance.As a First Generation Innovation Model, a Technology push such as SFT, is lacking of feedback and network interactions. On the other hand, the Networking as a Fifth Generation Framework of Innovation Modeling emphasizes on knowledge accumulation

and external linkages, systems' integration and extensive networking. As its results, it embeds interaction between different elements, enhances feedback loops between them, integrates R&D and improves marketing practices. Therefore, an empirical study was conducted among three groups of stakeholders- researchers, politicians and professionals in order to determine the importance of adopting SFT aiming to sustainable rural development. Rural development requires the insights of several established disciplines or traditional fields of study and needs to be connected to politics in order to achieve successful results, so this approach was implemented. More over if the goal is balanced socio-economic and environmental development-sustainability- the interdisciplinarity of the involved scientists should assist policy decisions and be of use to the application to rural strategic planning. Also the pros and cons of the stakeholders' participation in the planning of rural strategies were explored due to the fact that the communication between them does not always occur and their interests could be conflicted. With the use of qualitative and quantitative statistical methods, the results not only indicated the challenges rural areas face in relation to the adoption of SFT in Greece, such as lack of strategic planning and necessary infrastructures, but also revealed the main drivers for underdevelopment and environmental degradation in those areas which are, of low income and creditability, minor environmental consciousness. Finally the gap between the means -Research and Development- and the goal -sustainable rural development- was affirmed, which probably lays beneath the lack of communication and feedback between the stakeholders. Furthermore this research indicated that the rural- urban linkages in Greece should be studied as if they could to stimulate rural development perspectives.

KEYWORDS: sustainable agriculture, networking, stakeholders, strategic rural planning, quantitative analysis.

AGRICULTURAL BIOGAS IMPACT ASSESSMENT EMPLOYING INPUT OUTPUT MODELLING

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ABSTRACT

The objective of this paper is to estimate impacts generated for the economy and particularly for the bio-based sectors triggered by policy measures promoting biogas sector. For this purpose an integrated agro-industrial model is coupled to the input-output tables with special emphasis to distinguish bio-based sectors' transactions. Direct and indirect impacts can thus be quantified in terms of domestic production and jobs at the regional level. The capacity of such coupling of economic models is illustrated in Lublin Region (Poland), where the potential of agricultural biogas development is important, providing the quantitative information to evaluate support policies.

KEYWORDS: bioeconomy, agriculture, biogas, input output modelling.

INTRODUCTION

The currently observed global challenges such as climate change, drought, perturbation with global value chains or energy demand influence on research and monitoring of bio-based resources, which can be exploited on site. European Union (EU) and its country members have been working on developing bioeconomy, which can be a solution for the abovementioned problems. When defining bioeconomy, in research we can observe three visions: (1) bio-technology bioeconomy, where the accent is put on bio-technology research and commercialization, (2) bio-resource bioeconomy, where the biological raw material is the key, processed and upgraded in new value chains, and finally (3) bio-ecology bioeconomy, where promoting sustainability and biodiversity are the most

important factors (Bugge, Hansen, and Klitkou 2016). There are numerous available research studies on bio-based resources and bioeconomy, e.g. monitoring of EU bioeconomy (Kuosmanen, Kuosmanen, and El-Meligi 2020; Ronzon et al. 2017; Ronzon and M'Barek 2018), quantifying the residual biomass within EU (Hamelin et al. 2019) or preparing the bioeconomy national strategies (Sara Davies, Laura Griestop, Heidi Vironen, John Bachtler, Viktoriya Dozhdeva 2016), which help to assess the potential and significance on regional, national and European scale of economy. From an economic point of view, production, processing and use of biological resources by each sector of economy as well as intersectoral relationships are important to understand and quantify bioeconomy (Loizou et al. 2019; Ronzon et al. 2017).

The high interest of bioeconomy in a majority of European countries contribute to maximize, through sustainability, priorities of European policies. Increased attention of European countries to the sustainable bioeconomy make opportunities to create new jobs, increase labour productivity and project carbon neutral countries (European Commission 2018). One of the solutions to the increasing energy demand and GHG emission is to switch from coal resource to biomass, used e.g. in agriculture biogas production, which is a positive step in mitigation of climate change (Soussana, Klumpp, and Ehrhardt 2014; Sulewski 2018). Poland is one of the European Union (UE) members, whose energy production is based mainly on fossil fuels and hence is the second biggest user of solid fossil fuels in EU (EUROSTAT, 2018). After the initially successful development of agricultural biogas plants in Poland till 2016, in the last three years a stagnation could be observed. Nevertheless, after publishing of Poland's Renewable Energy Sources Amendment Act, in the Journal of Laws (the end of 2019), by the Polish government, there can be seen a potential for further development of bioeconomy in Poland. In particular, the strategic document "Energy Policy of Poland until 2040 – EPP2040", biomass and, more specifically, biogas, is recognized as one of the most relevant sources of renewable energy in the Country, development of which could contribute at the same time to solving issues related to bio-waste management.

Several studies partially investigate the status of the Polish bioeconomy, e.g. focusing on biotechnology (Woźniak and Twardowski 2018), presenting general data for all sectors of economy (Bio-based Industries Consortium 2018) or examining single sectors or cases as bioethanol (Mączyńska et al. 2019) and biogas (Bartoli et al. 2020).

The main objectives of this proposal are: i) to present example Polish Region (Lublin Region) bioeconomy sectors in the context of its economy in order to assess their importance and potential impacts on regional (agriculture Region) economy (using the latest available data and survey data) and, ii), to present the impact of the current state and future scenarios of the development of agricultural biogas sector in example polish Region on the regional bioeconomy.

Input Output analysis as a tool based on actual data, contributes with useful information for the bioeconomy advancement in the regional economy. Performing regional I-O tables is a task that appears in the international literature (Karelakis et al. 2020; Lampiris et al. 2019; Loizou et al. 2019). Direct importance and interlinkages of bioeconomy sectors with other sectors of economy can be quantified. In order to achieve the goals of the study, firstly the Input-Output (I-O) analysis is carried out to examine, with relevant accuracy, the importance, sectoral interlinkages and impacts of bioeconomy in the regional economy. Due to the lack of availability of regional I-O tables there is a need to construct such for Lublin Region. GRIT technique (Generation of Regional Input-Output Tables) is used to perform this step (Jensen et al. 2019). Secondly the existing agricultural biogas sector, including investment and operational costs - are investigated based on available data and questionnaires from agriculture biogas owners. Future scenarios concerning the potential development of the Polish agricultural biogas are analyzed following the approach recently proposed by Bartoli et al. (2020) for the case study of Lublin Region, a Polish NUTS 2 region located in the east of the Country, where a decentralized decision framework specific for biogas production is set up. The analysis includes calculation of I-O multipliers, which are used e.g. to measure the impact of agricultural biogas sector development, in all sectors of economy of Lublin Region in terms of employment, household income and output.

METHODS

A method that can examine the economy on regional scale, including interlinkages and impacts of sectors of the whole economy as well as creating bioeconomy sectors is I-O analysis (Mattas et. al. 2006; Mattas et al. 2009). Input-Output models and general equilibrium models which have advantages compared to partial equilibrium models: (1) effects on whole economy can be examined, (2) direct and indirect impacts can be measured due to e.g. introduced politics or scenarios. In spite of I-O merits, broad use and functionality within countries or

regions, there are some limits in theoretical ground: system of linear equations or calculation of fixed coefficients. Besides that, implementing confining assumptions in the analysis, the I-O analysis is kept unique and broadly used as an interpretive tool by researchers and policy makers.

To assess the specific impact of the agricultural biogas sector in example Polish Lublin Region and to project its future impact on the whole regional economy, the agricultural sector heterogeneity, the biogas technology state-of-the-art and the Polish institutional setting related to renewable energy production are modelled in a partial equilibrium framework. The model estimates market clearing prices and quantities at the intersection of supply and demand. The optimal number, size and location of biogas plants are derived at the equilibrium, in function of the policy tested. Including the model projections in the Input – Output analysis, the development of the biogas sector is therefore investigated in the holistic perspective of the Input-Output approach, overcoming the partial equilibrium models' limitations.

RESULTS AND DISCUSSION

In order to identify the most influential sectors in terms of multiplying effect and to support more efficient development on its sectors, Input Output multipliers are used in this study. Multipliers with highest numbers correspond with the strongest impacts in the economy of Lublin Region in Poland. The aim is to find sectors with high multipliers in terms of output, employment and income in order to support them.

For the purpose of evaluating impacts of agricultural biogas sector (current and future development) I-O multipliers are applied to implement different impact scenarios. The money flow to I-O sectors, basing on different scenarios of agriculture biogas sector development, is used to measure the potential impacts in terms of increasing employment, total gross output and household income.

CONCLUSIONS

This study provides valuable information on direct and indirect impacts on regional economy of example Lublin Region (Poland), focusing on agricultural biogas sector, with current state and future scenarios development, including created bioeconomy sectors in the I-O analysis. Investment and operational cost of agricultural biogas plant based on primary data and demand of the number of agriculture biogas plants estimated using recent data increase the value of analysis and may be used in further studies. Different development scenarios and bioeconomy interrelations focusing on agricultural biogas sector can be useful in policy-making decisions and preparing strategies on regional and/or national scale. Output from the analysis may contribute to developing the bioeconomy strategy for Poland, which is being prepared currently within the BIOEAST initiative (BIOEAST 2018).

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6th INTERNATIONAL SESSION
SOCIOECONOMIC ASPECTS
AND CONSUMER TRENDS
IN THE AGRICULTURAL SECTOR

CHAIRPERSONS: Efthimia Tsakiridou (AUTH) & Elena Raptou (DUTH)

SHRINKAGE OF AGRICULTURAL AND RURAL AREAS: THE CASE STUDY OF KASTORIA

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ABSTRACT

The increasing urbanization of modern societies has led to the shrinking of many rural areas all over the EU. In Greece, the area facing the one of the largest shrinkage is the Municipality of Kastoria (LAU 1) the capital city of the Regional Unit of Kastoria (NUTS 3), located in the North-Western part of the Region of Western Macedonia (NUTS 2) with 33.684 inhabitants in 2017. It is recognised as a mountainous area, with significant biodiversity, situated around the Kastoria Lake being a protected area of the NATURA 2000 network. Both simple (demographic) and complex (socio-economic) shrinkage are identified in the area. Regarding the simple shrinkage, it presents a population decline of 5.84% over the period 2001-2017 (as opposed to the EU level population growth), low fertility rates and low population density due to remote mountain villages and settlements deflated by the movement of people to other parts of Greece or abroad. Regarding the complex shrinkage, the Greek economic crisis started in 2010 appears to have a major impact. The economically active population of the area reduced to 45% of its total population and 25% of them are unemployed while the retirees represent the 23% (Hellenic Statistical Authority, Census 2011). A large proportion of the population in working age (15-64 years) - and mainly skilled labour - was lost in the period 2001-2017. The dominant in terms of income and employment sector of fur production, is experiencing a constant 10 years downward trend due to the EU trade embargo with Russia. The primary agriculture and livestock sector, as well as the trade sector are threatened by demographic changes and lack of investments in infrastructure and new technology. Another potential source of income in the area comes from an important historical background and a wealth of natural and cultural resources that could serve as tourist attractions.

However, all this heritage has been neglected and misused, resulting in no significant tourism development in the area and losses of employment opportunities in the tourism sector. The shrinkage is also exacerbated by the lack of quality public and private services. In agricultural areas in particular, the difficulty of access due to the mountainous terrain, the adverse weather conditions and the poor quality of the existing road network, the lack of specialized labour force and the settlement of the incoming migrants - mainly Albanian - to other parts of the country, mainly in large urban centers, further exacerbated the shrinkage trends in the area. On the governance side, there is a lack of any existing policy mechanism - formal or informal - at any administrative level, which could address the simple and / or complex shrinking trend. The population shrinkage of rural areas is a burning issue that is affected by a variety of social, economic, environmental, cultural, governmental and other factors and needs to be addressed immediately by applying EU, national and local scale policy measures.

KEYWORDS: shrinkage, rural development, local development, alternative tourism, EU regional and local policy.

INTRODUCTION

The Municipality of Kastoria is located at the north-west border of the Greece with Albania and it is one of the three municipalities that consist the Regional Unit (Prefecture) of Kastoria. The economy of Kastoria has always been based on agriculture, producing high quality farm products due to the specific local climate conditions. On the other hand, fur production was one of the main industries developed in the area marked its economy and character till today. However, during the last decade that coincided with the Greek economic crisis and the EU trade embargo on Russia, a sharp decrease in the fur industry performance led to a dramatic decrease in income and employment opportunities and decline in population numbers, encouraging the outmigration from the region. The aim of this paper is to examine the factors that led to shrinkage, to identify the problems and the obstacles that have arisen and to suggest the forms of support and policy recommendations that address or mitigate the problem.

METHODOLOGY

The research methodology applied both secondary and primary approaches. Secondary research includes literature review and secondary data review from EU and national sources. Concerning the primary research, thirteen structured interviews were conducted and a focus group with key stakeholders and experts from local, national and EU level. The interviews' guide had a specific form and structure for each group, taking into consideration the level of knowledge of the subject and the information the interviewees could provide. At the same time, a focus group was formed to conduct organized discussions to confirm and / or supplement the results of the research. The research was supported by a bibliographic review, as well as a statistical analysis of important data (demographic, economic, social, migration).

RESULTS AND DISCUSSION

Table 1 depicts the decreasing population trends of the area of Kastoria. This is also the case for Greece as a whole, on the contrary the EU's population increasing trend. The main factors that affect these trends are the fertility rate decline, the increase of deaths rates and immigration trends. The Municipality of Kastoria has a low population density as well as the Regional Unit of Kastoria. The data show that the fertility rate in the Case Study area is very low, corresponding to one birth per woman. Table 1 shows a negative net migration rate in the Regional Unit of Kastoria as well as in the Region of Western Macedonia. The Region of Kastoria is losing a very important part of the working age population (15-64), while in many cases this is a skilled workforce in particular through the period from 2001 until 2017. The same problem faces the rest of the country as well. The GDP figures show a clear negative trend during the period of the still ongoing Greek financial crisis.

Table 1. Basic demographic and socio-economic trends behind rural shrinkage

Indicators	Spatial level	Case study area (if available)	NUTS 3	NUTS 2	NUTS 0, Country	EU28
	Name	Municipality of Kastoria	Kastoria	Dytiki Makedonia	Greece	European Union
	Code		EL532	EL53	EL	EU28
Total population on 1 January – persons (demo_r_pjanaggr3)	2000	36.566 (2001)	51,144	287,156	10,775,627	487
	2017	35.773 (2011)	47,723	271,488	10,768,193	511
Population change between 2000 and 2017 ([Population 2017-Population 2000] / Population 2000 100) – percentage* (demo_r_pjanaggr3)	2000–2017	-0.02 (2001-2011)	-6.69	-5.46	-0.07	4.95
Population density – persons per km2 (demo_r_d3dens)	2000	48,55 (2001)	30.00	31.00	82.60	111.90
	2017	46,96 (2011)	28.00	29.20	82.20	117.70
Total fertility rate – number (demo_r_find3)	2000			1.46	1.25	1.46
	2017		1.25	1.34	1.35	1.59
*Net migration rate (Net migration 2000–2017 / Population 2000 * 100) – percentage* (demo_r_gind3)	2000–2017		-3.52	-2.45	0.77	4.54
Population projection (EUROPOP2013) – persons (proj_13rpms3)	2020	25.055	47,582	269,915	10,703,434	512 million
	2030	24.315	43,212	246,381	10,090,065	518 million
	2040	24.243	39,228	226,744	9,594,050	524 million
	2050	24.236	35,229	206,896	9,133,990	526 million
*Working age population (15-64 years old population / Total population *100) – percentage* (demo_r_pjanaggr3)	2000		66.82	65.53	67.94	67.09 (2001)
	2017		63.73	63.05	64.02	64.98
GDP per capita – purchasing power standard (nama_10r_3gdp)	2000		10,500	14,800	17,100	19,800
	2016		13,000	17,400	19,800	29,300
GDP per capita – PPS in percentage of EU28 average (nama_10r_3gdp)	2000		53	75	86	100
	2016		45	59	68	100
Convergence of GDP per capita to the EU28 average (1 + [GDP per capita 2016 - GDP per capita 2000] / GDP per capita 2000) (nama_10r_3gdp)	2000–2016		0.85	0.79	0.79	1.00

Source: ESPON

The research on the structure and involvement of the Greek Administrative System in the phenomenon of rural shrinkage revealed a very complicated framework consisting of many administrative levels, local, regional and national. An overview of the organizations/institutions involved in rural/regional development and contributing to mitigation of /adaptation to population shrinkage in diferent territorial scales is depicted below.
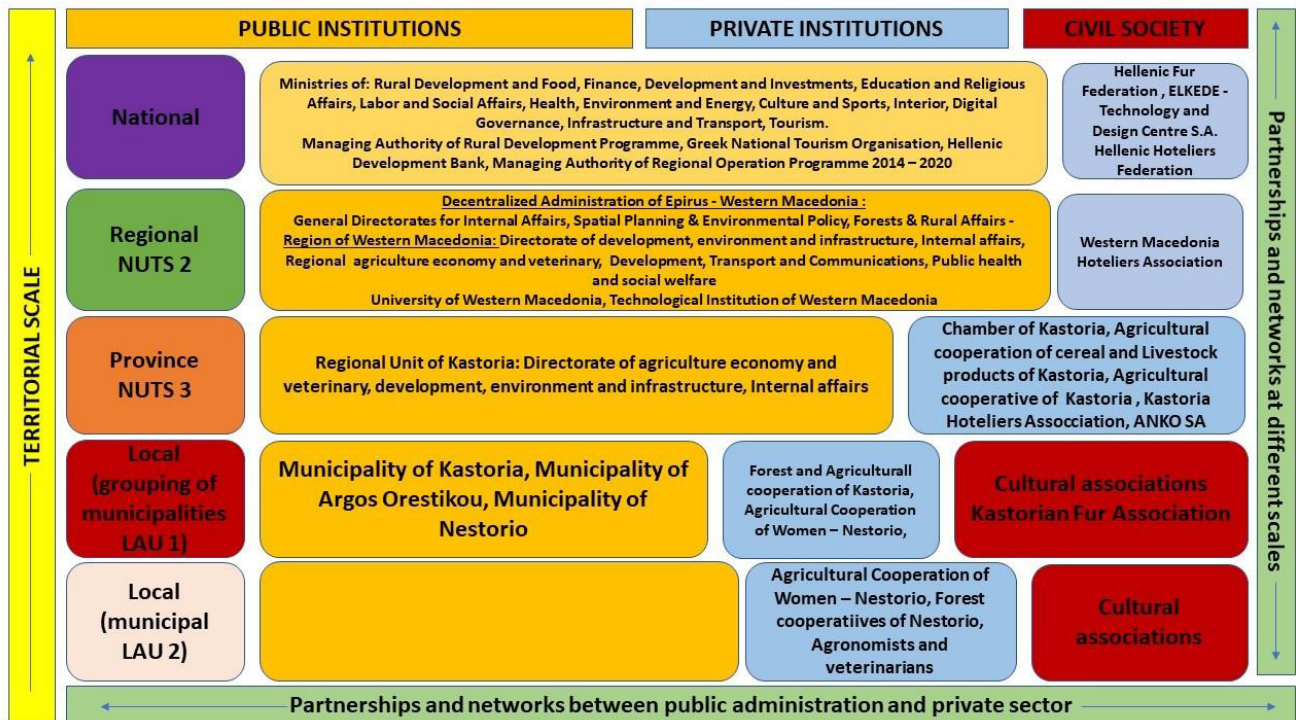
Figure 1. Governance Framework

CONCLUSIONS

The Regional Unit of Kastoria is affected in many ways by the shrinking process, whether it is simple and concerns only population shrinkage or it is complex and affects other sectors as well. The shrinkage occurs overall in the Region, with the rural area being affected more than the urban centre of Kastoria. As shown by the data analyzed in the research, this is attributed to a number of factors such as demographic, economic, social, migration and governance related issues.

These factors had led to a suggestion of specific policy recommendations in order to deal with shrinkage related issues in the area. These include the effective coordination and operation among the governance authorities, the design of a comprehensive policy to focus on shrinkage, the introduction of innovations in the agricultural holdings/enterprises, the improvement intergovernmental processes and coordination, the adoption of a bottom-up approach taking into account the views, needs and problems of civil society, the strengthening of other productive sectors apart from the fur production, the promotion and development of tourism through the rational exploitation of local natural and cultural resources, the proper financing in the areas that need urgent support, the use of proper promotion and marketing tools for local agricultural products, the integration of the region in a favorable tax regime, the support and reinforcement of the educational infrastructures, an integrated and long-term policy design for new immigrants and refugees in such a sensitive boarder area, the completion of agricultural investment projects and the development of infrastructure (roads, railways, schools, hospitals, broadband internet), enabling operation from distance and fast and safe mobility and accessibility to public services.

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SOCIO-ECONOMIC IMPACT OF ECOLOGICAL FARMING ADOPTION IN CRETE: MAPPING STAKEHOLDERS' PERCEPTIONS USING Q AND DELPHI METHODOLOGIES

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ABSTRACT

This study seeks to forecast the socio-economic impact that the adoption of ecological farming approaches would have on the island of Crete in ten years. To this end, two methodological approaches were used, Delphi method and Q-methodology, to get a more comprehensive view on the topic and address the latter more effectively, by exploring it from two different angles. Results show, among others, that adoption of ecological farming practices will lead to an increase in collaboration between farmers, will positively affect consumer behavior towards locally produced food, and will increase the need for farmers to improve their skill level and, consequently, the need for more farm advisors. Results could be used for creating tailored policies for the region, to support the shift to more ecological farming approaches.

KEYWORDS: ecological farming approaches, ecological practices, Q-methodology, Delphi method, Crete.

INTRODUCTION

The Mediterranean region is characterized as one of the main *"Climate change hot-spots"*, as it has been found to be highly vulnerable to climate change (Giorgi, 2006). In recent years, agroecological approaches have gained momentum as a holistic solution encompassing environmental, social, and economic principles, that could potentially foster climate change adaptation and strengthen the sustainability and resilience of farms and consequently that of rural communities. However, few studies evaluate the socio-economic impact of the adoption of agroecological practices (D'Annolfo et al., 2017). The aim of this study is to investigate the potential socio-economic effects that adoption of ecological farming would have in ten years in the region of East Crete; namely in the Regional Units of Heraklion and Lasithi. To this end, the Q and Delphi methodological approaches were used to get a comprehensive view on the topic by mapping experts' perspectives on *"what can potentially happen"*.

METHODS

The Delphi method used in this study allows for the accumulation of qualitative information from experts regarding the future of the adoption of ecological farming approaches in East Crete. It is one of the most widespread qualitative techniques used in forecasting, seeking to forge a consensus of expert opinions on a certain issue being examined (Horrillo et al., 2016). More specifically, this method is an iterative process, in which

the experts are participating, anonymously, in a series of questionnaire rounds, while in each round they are receiving feedback of the results from the previous round, enabling them in that way to reassess their views (see Linstone & Turoff, 1975). For this study, Delphi method was implemented in 3 rounds, using LimeSurvey, an online survey tool, as this technique does not require in-person participation or any conduct among the experts (Graefe & Armstrong, 2011). After the third round was completed, a Kendall's W test was performed, as demonstrated by Cafiso et al. (2013), to measure the level of respondents' agreement in the questionnaires' ranking type questions. Regarding the Q-methodology, it allows for the systematical examination of the subjective perceptions of the local experts that participated in the study with respect to the future of ecological farming approaches in East Crete. A set of statements related to the research topic was determined after its' collection from the literature, and the experts were asked to place them on a grid based on their beliefs. Next, the data were collected, and an inverted factor analysis was employed to rank each statement in relation to the other (Watts & Stenner, 2005; Zepharovich et al., 2020). In cases where experts shared an opinion, they were grouped in the same factor, and finally, the representative average view in a group was presented in each of the factors. For both methods, the selected experts had a strong academic, research or work experience background in ecological farming approaches in East Crete; while their close interconnection was verified by the obtained results.

RESULTS AND DISCUSSION

Results stemming from the experts' opinions in both Delphi and Q exercises indicate that the adoption of ecological farming approaches will occur from a similar proportion of the region's farms (15% and 10%, respectively). Nevertheless, according to the Delphi responses, these farms will be randomly spread out across the area, with the main reason stated to be that of the rugged terrain of Crete, while the Q responses show that adoption of ecological farming approaches will promote the formation of clusters, as well as the cooperation among farms. The latter is also verified by 69% of the Delphi respondents who agreed that collaboration among farmers will increase. These cooperation effects will spillover and affect consumer behavior, leading to an increase in buying food that is locally produced. Furthermore, in both Delphi and Q exercises, experts predicted that a clear need for farmers to increase their skill level will emerge as a result of the ecological farming practices adoption, that could be said it justifies the 94% of Delphi respondents who stated that there will be a need for advisory services to increase their personnel. Regarding farm employment needs, Delphi respondents indicated that the adoption of ecological farming will lead to a slight increase in both total farm and migrant labor. The increase in need for migrant labor is also consistent with the results obtained in Q. Finally, all Delphi respondents unanimously agreed that ecological farming adoption will have a positive impact in farmers' quality of life with the reduced exposure in chemical inputs being the most commonly stated reason.

CONCLUSIONS

The results emerging from this study, could contribute significantly to the establishment of tailor-made for the region policies, that could foster the transition towards more ecological farming approaches. For example, findings clearly indicate that more farm advisors will be needed in order to facilitate farmers in the ecological farming adoption. In addition, given the fact that results between the two methods do not differ significantly, it appears that the two methodologies are complementary of one another; thus, implying that the simultaneous use of both methodologies could provide similar future studies with robust and more detailed results. Another approach would be to first employ the Delphi method and use its results to create the statements that would in turn be used in the Q-methodology. However, the goal of the present study was to employ both methodologies simultaneously, without using identical questions and statements, to see whether stakeholders would reach the same conclusions and to examine whether two methodologies that have been continuously criticized in the literature on their subjectivity could provide robust results and act as complements of one another.

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ECONOMIC CHANGES' IMPACTS UPON RURAL REGIONAL INCOME AND EMPLOYMENT: A SAM APPROACH

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ABSTRACT

Policies and measures for agriculture and the agri-food sector continuously change over the last decades and this has significant and sometimes negative effects on economies. Agriculture used to hold a large share on national and regional economies both in income and employment. Now, in the aftermath of the recent economic crisis, this share has been critically diminished. However, since the agri-food sector is a major sector for the economic viability of many regions, this decrease arises some questions. What will be the effect of these economic changes to regional economies and particularly to their income and employment? To answer this question an attempt is made to research the structural changes and quantify the effects of the exogenous changes on the economic base of a rural region, along with their impacts on income and employment before and after the economic crisis.

The region under study is a NUTS II region, Anatoliki Makedonia and Thraki. This region over the last twenty years presents a critical decline both in population and income, as it has high migration rates, low birth rates and high unemployment. To achieve the intended goal was used a combination of Input-Output and Social Accounting Matrices (SAMs) methodologies. The first technique provided regionalized Input-Output tables, which were used for the construction of the regional SAM's. The second technique outreaches the first as it investigates the exogenous elements' economic impacts such as government or external trade on an economy's endogenous accounts, such as households. This allows the regional economy results' direct measurement caused by policy changes in output supply, input demand, income and employment, along with the identification of the interrelationships between the sectors and their importance to regional economic viability.

The SAMs multipliers' results showed the structural linkages' quantification of the regional rural economy. In addition to that, are highlighted the interrelationships among the vital sectors of the economy. Moreover, the results demonstrated the importance of the government funding not only to the public and tertiary sectors but also to the entire regional economy.

KEYWORDS: regional social accounting matrices.

INTRODUCTION

The resent years in all developed countries occur a great deal of economic and structural changes, which usually denote the diminishment of many economic sectors and eventually lead to many economic problems. These problems are intensively manifested in regions that depend their economic viability on one or few productive sectors like agriculture. The agricultural sector's decrease has deeper effects, since agriculture is the provider of their raw material.

In this paper an attempt is made to research the impacts of economic crisis and structural changes and quantify these exogenous changes' effects on a rural regional economy, income and employment. To achieve that, the Input-Output and the SAMs methodologies were applied. The SAMs are a very useful econometric tool (Pyatt, 1976, Powell and Round, 2000, Thiele and Piazolo, 2003) as they can be used as a database for policy planning in developing countries. Its framework may contribute a great deal to a useful arrangement of different sources of data, such as national accounts, taxation data, household surveys, input-output tables, which with its application constitute an economy-wide data framework. Also, for many less developed countries the construction of the SAMs has proved to be vitally important since it deals sufficiently with their significant problem of insufficient, unreliable and poor-quality data.

METHODS

The Input-Output model is often used for impacts' estimation in regional employment from agricultural changes. It was selected firstly because it provides thorough regional economic results' description and estimation. And secondly because the table is needed for the construction of the SAMs. The secondary hybrid method GRIT (Generation of Regional Input-Output Tables) that was proposed by Jensen et al (1979) was used for the regionalisation of the national Input-Output table (Tohmo T., 2004).

SAM is a square matrix in which the expenditures are listed in columns and the receipts in rows. As the sum of all expenditures by a given account must equal the receipts' total sum or the corresponding account's income, it is implied that row sums must equal the column sums. There are six types of accounts in SAMs: production activities, commodities, factors (labour and capital) the current accounts of the institutions, the capital account, and the rest of the world account (Psaltopoulos D. and Efstratoglou E. 2000). Moreover, to create more transparency and to examine the nature of economic linkages that lead to these outcomes, it is possible to decompose the SAMs multipliers further. SAMs would therefore be useful in making predictions about the way economy is evolving due to exogenous changes' effects. It is so, a very useful policy planning and decision-making analytical tool.

RESULTS AND DISCUSSION

For the purposes of this study was selected the region AMT, in northeast Greece, that the last decades underwent a population decrease, is mainly rural. The national Input-Output tables of 1998 and 2010 were regionalised based on GRIT. The initial national tables were aggregated into 18 sectors, which were the main sectors of the regional economy in means of economic output (Mattas et al., 1984). The calculated regional input-output tables and direct requirements matrices produced the AMT total requirements matrices, which were embedded to the regional SAMs. Following the construction of the regional SAMs with the application of the methodology suggested by Pyatt and Round (1979) and Roberts (2003) derived the accounting multipliers for the AMT region.

The constructions sector has the highest accounting multiplier followed by the food, beverages and tobacco sector and the textile materials and products sector. Being among the three top sectors proves the importance of the food, beverages and tobacco and indirectly the significance of the agricultural sector in the regional economy as its primary input provider. The results indicate a specific path for policy makers and local authorities, through direct support or investments, in order to achieve regional growth in this less developed region.

SAMs analysis produces direct employment multipliers for the regional aggregated economic sectors. Agriculture, hunting, forestry and fishery sector has the highest employment multiplier. This implies that a sectoral investments' increase will increase the regional employment. Wholesale and retail trade sector is the next important which is justified since the region has increased trade because of its remoteness and limited resident diffusion. From the SAMs multipliers decomposition the cross effects or open loop multipliers show the impact of the structural changes in relevance with the under-study region and the rest of the country. These multipliers show the decreased inter-regional feedback effects that indicate a low amount of inter-regional effects among AMT, the neighbour region and the rest of Greece.

CONCLUSIONS

The constructed SAMs provided a concrete quantitative basis that made possible to make a static analysis of the relationship between the productive sectors of the regional economy of AMT and particularly of agriculture and the agri-food sector. SAMs multiplier analysis can be considered as a very important policy modelling application that estimates the effects of structural changes in exogenous variables upon endogenous variables in the accounting framework (Pyatt and Round 1985). The domino effects of an exogenous increase in household sector, public sector and production accounts can be traced through this analysis.

The results highlight that the AMT regional economy is depending significantly on the agricultural and agri-food, beverages and tobacco sector for its economic viability. For the AMT also the results indicated the importance of sectors such as constructions and wholesale and retail trade. These sectors present the highest multiplicative impacts given any economical and structural change. Moreover, the region has low closed loop multipliers meaning that there are also low interregional effects between the region and the rest of Greece. Finally, for the region, SAMs represent one important step towards more effective regional policy analysis and offers a path on which future regional policies and strategies can be developed to lead towards more balanced and complete regional development.

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7th INTERNATIONAL SESSION
AGRICULTURAL MARKETING AND MARKET TRENDS

CHAIRPERSON: Spyridon Karytsas (HUA)

CULTIVATION OF STONE FRUITS IN UTTARAKHAND: MARKET ACCESSIBILITY OF FARMERS AND MONOPSONIST BEHAVIOUR OF INTERMEDIARIES

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ABSTRACT

Since independence in 1947, farm income in India has not grown in the same proportion as food production, as the Situation Assessment Survey (2013) of farmers' data reveal. Average annual income of the farmer household was only about Rs 101 a day during 2011-12. In this paper, I focus on two important supply-side factors responsible for farmers' exploitation- dependence on intermediaries, and lack of market accessibility due to poor infrastructure. Conventional theories focus mainly on sources of production costs, ignoring the role of marketing costs and margins that accrue to trade intermediaries. Keeping that in mind, this paper analyses the supply chain of stone-fruits in Uttarakhand, a hill state in northern India. Uttarakhand is the leading producer of stone-fruits (peach, plum, apricot and pear among others) in India. I use original survey data constructed by doing a primary survey in Nainital district of Uttarakhand, done using multi-stage stratified random sampling. The data has been collected by interviewing 200 farmers spanning across 20 villages of two different blocks. Traders in the markets, transporters and other actors in the supply chain have also been interviewed. My main objective is to trace the supply chain of stone-fruits and analyse the distribution of profits along this chain, while accounting for how topography affects farmers' incomes and dependence on intermediaries. My study finds that high post-harvest (marketing) cost coupled with poor infrastructure and information asymmetry helps traders in wielding power over the farmers. Rich farmers fare relatively well as compared to their poor counterparts. This is primarily due to the dependence of small farmers on the traders for credit- both for agricultural and non-agricultural purposes. Also, because these traders deal in bulk and help the farmers dispense-off their produce quickly in the absence of storage amenities, farmers

prefer to deal with them even if this implies additional cost in the form of commissions of traders and transporters. However, calculations show that after accounting for opportunity cost of family labour, even the farmers with large landholdings incur losses. The study finds that in the absence of sound infrastructure, intermediaries become indispensable to the farmers. Policy implications of the paper include an urgent need to develop storage and food-processing infrastructure. Also, the paper suggests that mere Information and Communication Technology (ICT) tools such as cell phones can do little to increase farmers' profits, if not done in conjunction with an improvement in credit-lending and agricultural marketing institutions.

KEYWORDS: agricultural markets and marketing, agricultural finance and credit, agricultural policy and food policy, farmers income, labour cost.

INTRODUCTION

The exploitation of farmers by intermediaries in the form of low prices is one of the major reasons for the low income of farmers in India (Mitra S and S, 2017). Only a small share of what the consumer pays for the product reaches the actual producers. Conventional theories focus mainly on sources of production costs, ignoring the role of marketing costs and margins that accrue to trade intermediaries (Bardhan, Mookherjee, and Tsumagari, 2013). In developing countries, small farmers often cannot access organised markets directly. Instead, they sell to middlemen who resell their output to distant buyers. The large size of the market, poor transport, marketing and infrastructural facilities ensure that many isolated regional markets exist for farm produce. The market structure is oligopsonistic between the producers and intermediaries and oligopolistic between the intermediaries and consumers. Given the ever-increasing cost of agricultural inputs, the unpredictable nature of production and prices and the long agricultural supply chain with a large number of actors, which is one of the distinguishing features of agriculture in developing economies like India, it is important to ascertain the profit made by the farmer once the produce reaches the consumer.

This paper will try to document the supply chain of stone-fruits in Uttarakhand, a hill state in northern India and analyse the profits of farmers and traders. Agriculture is a predominant sector in the state economy which contributes around 23.4% in State Domestic Product. Uttarakhand ranks first in the country in production of peach, plum, pear and apricot and third in the country in production of apples (Uttarakhand, Directorate of Economics and Statistics). The supply chain is traced using the data obtained from two hundred farmers for the year 2018. The findings show that farmers growing stone-fruits earn small nominal profits. These profits become zero or negative when implicit costs like family labour are included. Also, small farmers fare worse than their rich counterparts who get a better price for their produce. The main reason for this is a lack of adequate storage and processing infrastructure and the dependence of farmers on intermediaries for agricultural and non-agricultural purpose.

Prominent studies of agricultural marketing in India include one by Chand et al (2011) followed by that of (Nilabja, 2013). Chand, Prasanna, and Singh (2011) have studied the marketing efficiency of different horticultural commodities in the Indian states of Andhra Pradesh, Punjab, Karnataka, West Bengal and Tamil Nadu. They found that marketing efficiency increases as the number of stakeholders in the supply chain decrease and that the maximum portion of the consumers rupee is appropriated by the retailer whereas farmer gets the minimum share. Mitra et al. (2017) found that middlemen margins were between 28% and 38% of the wholesale price for potatoes. This suggests that farmers could earn 65-83% more if they could sell directly in wholesale markets. In the international literature, Fafchamps and Hill (2005), McMillan, Rodrik, and Welch (2002) estimate rates of pass-through are less than 50 percent from retail prices to producer prices in the case of Ugandan coffee and Mozambique cashews.

METHODS

A comprehensive field survey was conducted in Nainital district of Uttarakhand. Multi-stage stratified random sampling was conducted. Two blocks, Ramgarh and Betalghat were chosen for the survey. Villages were taken as the First Stage Unit (FSU). Based on net area sown, twelve villages in Ramgarh and eight villages in Betalghat were chosen for the field survey. Stratification was done on the basis of (a) distance from the nearest town and (b) the Scheduled Caste (SC) and Scheduled Tribes (ST) population in a village. Based on these parameters, six villages from Ramgarh were chosen out of which three were near and three were far from a given town. Similarly, four villages from Betalghat were chosen using this parameter out of which two were near and two were far from a given town. Likewise, on the basis of caste composition data of villages, six villages from Ramgarh were

chosen out of which three had high and three had low share of SC and ST population. Similarly, four villages from Betalghat were chosen using this parameter out of which two had high and two had low shares of SC and ST.

Farmers were chosen as the Second Stage Unit. At the village level, 10 farmers were chosen from each village on the basis of the size of their landholdings: 5 small and marginal famers (<25 *naali*[1]), 3 medium farmers (25-50 *naali*) and 2 large farmers (>50 *naali*). Total sample size consists of 200 farmers. The survey was done from October 20, 2018-March 30, 2019.

Well-designed questionnaires pre-tested in a pilot study were employed to assimilate the data. The supply chain was traced in the forward direction. Since it was known beforehand that the bulk of the production of these farmers is sent to markets in Haldwani and Delhi, the other actors of the supply chain, namely commission agents, transporters, wholesalers etc. were interviewed in these markets.

RESULTS AND DISCUSSION

We find that material costs are the highest in the overall cost of production. We categorise it further to see the components and their respective share in the material cost. We have divided the market costs into two components-pre-harvest cost (which includes cost on buying new saplings, pesticides, fertilisers and equipment), and post-harvest cost or marketing cost (which comprises cost on wood planks or *baardaana* for making packing boxes, pine leaves or *peerul* for providing cushion to the fruits while transportation takes place and the cost of trucks for transporting the fruits to the markets). This is shown in Table 1 from where we see that across all the land classes, pre-harvest costs form a tiny proportion of the total costs with a share of around 10-13%. On the other hand, more than three-fourths of the total material cost is dominated by post-picking cost or marketing costs. Both transportation and wood consist of the highest costs which together comprise about 65% of the total marketing cost. Cost on pine leaves is about 8-9% of the marketing cost. All these marketing costs are higher than the pre-harvest cost, implying that it takes more money for the farmers to get the produce to the market rather than in producing it.

Table 1. Classification of Material Costs into Pre-Harvest and Post-Harvest (Marketing) Costs across Various Land Classes (All Villages). Figures in brackets are % of the total. Costs are in Rupees.

Size Class (*naalis*)	0-25 *naali*	25-50 *naali*	50 *naali* **and above**
Material Cost	59.56 (100)	62.38 (100)	57.96 (100)
Pre-Harvest Cost	12.43 (20.86)	13.89 (22.26)	10.48 (18.08)
Saplings	3.45 (5.7)	4.23 (6.78)	2.28 (3.93)
Pesticides/Fertilisers	6.75 (11.33)	7.05 (11.30)	6.75 (11.64)
Equipment	2.23 (3.74)	2.61 (4.18)	1.45 (2.50)
Post-Harvest Marketing Cost	47.13 (79.13)	48.49 (77.73)	47.48 (81.91)
Wood	18.63 (31.27)	20.28 (32.51)	21.78 (37.57)
Pine Leaves	8.45 (14.18)	9.30 (14.90)	8.14 (14.04)
Transportation	20.05 (33.66)	18.91 (30.31)	17.56 (30.29)

Source: Sah, calculations from primary survey

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1. 20 *naalis* = 1 *acre*. This is the standard unit for land classification in Uttarakhand where lands are fragmented and too small, mostly in the shape of terraces. The land records of government bodies also employ this unit for land details.

Table 2 discusses the revenues and profits of the farmers across all land classes. Average price (or price) in the table is the sum of the prices received by the farmers at different periods of time by selling various quantities of fruits divided by the quantity sold in the given time period. This is shown in the second row of Table 2 and we see that farmers in the largest land class get the highest revenue per kg. Average revenue is highest for the largest land classes which means that farmers with larger landholdings receive better price for their produce. The actual profits received (difference between revenue and actual cost) is shown in the third row of the table. We see that farmers with the largest land classes receive the highest monetary profits. We then start calculating profits after accounting for imputed cost on labour, material and land and credit. From the table, we see that the profits after accounting for imputed labour are positive only for the largest land class. This too is a very small amount of 0.30 rupees. Profits become negative for all land classes after accounting for imputed costs. The least amount of loss is faced, expectedly by the farmers from the largest land class.

Table 2. Average Price Received and Profit accrued (Rs/kg) across Size Classes (All Villages).
Price and Profit in Rupees

Size Class (naalis) Profit	0-25 naali	25-50 naali	50 naali and above
Price (per kg) : P	112.50	114.33	128.08
Profit Actual: X1	27.10	25.39	40.36
Profit (X1+Imp Labour): X2	-13.22	-16.30	0.30
Profit (X2+Imp Material): X3	-16.19	-20.87	-2.67
Profit (X3+Imp Land+ Imp Credit): X4	-23.28	-31.90	-13.42

Source: Sah, calculations from primary survey

CONCLUSIONS

This study finds that farmers involved in the cultivation of stone fruits in Uttarakhand earn positive nominal profits, but these quickly become negative when implicit costs on labour, material etc are accounted for. We find that post-harvest marketing costs are the highest contributor in costs, implying it is difficult for the farmer to take his produce to the market than to produce it.

Observations from the field study show that farmers are completely dependent on intermediaries to market their produce. The most important reason behind this is the lack of physical infrastructure in terms of cold-stores and agro-processing units. Since these fruits are of a highly perishable nature, this coupled with an absence of storage facilities causes distress sale on part of the farmers. Also, there are no processing industries in the region. Private buyers, NGOs buy only the best grade, but in small quantities from the farmer. Farmers are often reluctant to sell to these actors as they prefer to dump their entire harvest in *mandis* where the traders purchase large quantity of fruits throughout the season.

Also, there is high dependence of the farmers on the traders for credit- both for agricultural and non-agricultural purposes. Although credit forms a small component of the total costs in our study (5-7%), we find that about 78% of the farmers in our sample had taken loans from intermediaries whereas only 12% of the farmers had borrowed from formal sources such as government banks or cooperatives. Also, farmers from the smallest land class borrow the most from intermediaries (40%), and large farmers borrow the least (4%). Small farmers enter into informal contracts with the traders who provide the farmers with help- both in cash (for agricultural activities as well as for functions like marriages) and in-kind (in the form of inputs like fertilizers, pesticides, wooden planks for packing the fruits, or in the form of ration to feed the family during slack season). In lieu of this, farmers are bound to sell their harvest to the traders. Finally, there prevails an information asymmetry between the farmers and traders. Farmers have to accept whatever price is quoted for the fruits by the traders in the mandis.

There are important policy implications of the findings- an urgent need to develop storage and food-processing infrastructure that will be as helpful to the farmers as the roads that help in improving market accessibility. Also, ICT tools such as cell phones can do little to increase farmers' profits, if not done in conjunction with an improvement in credit-lending and agricultural marketing institutions.

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"AGRO", "AGRI", OR "RURAL": THE DIFFERENT VIEWPOINTS OF TOURISM RESEARCH

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ABSTRACT

The objective of this study is to review the different viewpoints of research addressing "agro", "agri" or "rural" tourism, ascertain the implications of relevant scientific articles and suggest future research avenues. A two-step

systematic approach was followed in identifying "agrotourism", "agro tourism", "agro-tourism", "agritourism", "agri tourism", "agri-tourism" or "rural tourism" articles in the Scopus database. Articles were selected if corresponded to the keywords, sustainable development, sustainability, local development; thus 354 papers were selected. Findings indicate that the literature does not analyze in depth integrated approaches to sustainability, sustainable and local development. Results are discussed mainly on qualitative grounds, from the supply side and with limited policy recommendations. They also display that the papers mainly refer to single case studies and comparative studies are lacking.

KEYWORDS: agrotourism, agritourism, rural tourism, literature review.

INTRODUCTION

The meaning of the terms "agro-", "agri-" or "rural" tourism differs from region to region, year to year, community to communtity, enterprise to enterprise. In the exlporation of scientific articles related to "agro-", "agri-" or "rural" tourism it is obvious that the results increase over time which also reveals the growing interest for these kinds of tourism. Lane & Kastenholz (2015) underline that while rural tourism appears to have grown, it has also changed, and academic interest in it has changed too. Dimitrovski, Leković & Joukes (2019) try to delimit the most frequent topics within agritourism literature by defining a sample of 21 Crossref journals indexed in Web of Science (for agritourism research see also recently articles of Barbieri, 2020; Barbieri, & Streifeneder, 2019). In this study through an international literature review, the findings of articles in Scopus database on "agro-", "agri-" or "rural" tourism are synthesized and analyzed thematically.

METHODS

With the goal to analyse the different viewpoints of scientific research addressing "agro-", "agri-" or "rural" tourism we followed a two-step systematic approach. First, we defined the title and the keywords for the search of documents dealing with these forms of tourism. The English terms used for the literature review were "agrotourism" or "agro tourism" or "agro-tourism" or "agritourism" or "agri tourism" or "agri-tourism" or "rural tourism". These terms were searched in the title, abstract, and keywords of scientific articles in the Scopus database. The search was undertaken in early 2020 and yielded 2,339 documents. Following, the results of keywords in those articles were placed into categories (based on the idea of Lane & Kastenholz, 2015), and the journals where these articles were published and the origin-country of the authors were identified. In the second stage, the articles were limited to the ones including the keywords a) sustainable development; b) sustainability; c) local development, and the final number of papers was 354. At this stage, the full papers were studied and classified under seven main themes as follows: 1) the three dimensions of sustainable development: economy, society, environment; 2) integrated approaches to sustainable development, sustainability and local development; 3) three additional issues very important for the tourism sector: supply, demand and residents; 4) policy; 5) geography of the cases: case study area; 6) case study country; 7) methods used: qualitative and quantitative. These seven main themes and approaches were not exclusive, and each paper could be classified under more than one theme and/or approach.

RESULTS AND DISCUSSION

From the analysis of scientific papers' keywords, summarized Table 1, we can conclude that many different form(s) of tourism are referred to and terms are used interchangeably (for example farm tourism, sustainable rural tourism). Moreover, a significant percentage of keywords include geographic information (e.g. countries, regions and characteristics of the selected case study areas). Planning, developing, managing and monitoring rural tourism destinations is a key concern, with particular interest in its economic dimensions; on the other hand, the intergrated concept of sustainability and rural/regional development approaches rate lower in the hierarchy of research interests. Furthermore, "new trend" keywords (such as marketing, innovation authenticity, social capital) which appeared in the field in the last 10-15 years are frequently refferred to. Cultural heritage, community (social), governance, landscape, and recreation are all surprisingly underrepresented. Nevertheless, more unexpected are the low scores for environment/ecology, planning and land use.

Table 1. Keywords in categories from "Agro-", "agri-", or "rural" tourism articles in the Scopus database (March 2020)

Keywords in categories	Number of results (N)	(%)
Form(s) of tourism	1,923	24.8
Countries/regions/geographic position-characteristics	1,692	21.8
Tourism management and development	886	11.4
"New trend" keywords	593	7.6
Economics	534	6.9
Sustainability	428	5.5
Rural/regional development	361	4.7
Agriculture	226	2.9
Methods	214	2.8
Environment/ecology	176	2.3
Planning and land use	158	2.0
Cultural heritage	141	1.8
Community	122	1.6
Governance	96	1.2
Landscape	79	1.0
Farm	80	1.0
Recreation	53	0.7
Total	7,762	100

Source: https://www.scopus.com, processed by the authors.

With the use of open source knowledge maps, based on 100 most relevant documents (52 open access) taken from BASE (which provides access to over 100 million documents from more than 5,200 content sources in all disciplines and uses journal/newspaper article document types) until 10th of November 2019, an overview of agritourism is provided in Figure 1. The algorithm groups together papers that have many words in common, similarly to our abovementioned keywords grouping in categories. Knowledge maps provide an instant overview of a topic by showing the main areas at a glance, and papers related to each area. This makes it possible to easily identify useful, pertinent information.

The great majority of "agro-" agri-" or "rural" tourism related papers are published, as expected, in tourism journals. Tourism Management leads the field, closely followed by Sustainability and the Journal of Sustainable Tourism. Table 2 presents the country of authors' affiliation. China and USA top the list, with almost the same number of papers, followed by Spain, United Kindom and Italy, each with over 100 papers over the years 1975-2020.

During the second stage of our analysis an noticeable finding was that even if "agro-", "agri-" or "rural" tourism are important as economic, social, and environmental activities, the literature does not analyze in depth integrated approaches of sustainability, sustainable and local development. Their findings are discussed mainly qualitatively especially from the supply side of such activities, and their combination with policy recommendations is limited. Findings also indicate that the papers most frequently examine single case studies and lack of comparisons between different cases.

Figure 1. Knowledge map for agritourism

Source: https://openknowledgemaps.org/ (20/03/2020)

Table 2. "Agro-", "agri-", or "rural" tourism papers (1975-2020) by country of authors' affiliation (only countries with >50 papers are shown).

Country of authors' affiliation	Number of results (N)
China	258
United States	255
Spain	206
United Kingdom	161
Italy	130
Romania	114
Malaysia	105
Poland	80
Australia	69
Portugal	69
Indonesia	62
Canada	61
France	51
Greece…	51
Total	1,672

Source: https://www.scopus.com, processed by the authors.

CONCLUSIONS

From our analysis it seems that "agro-", "agri-" and "rural" tourism need to adopt the concepts of sustainable development and sustainable tourism (Lane & Kastenholz, 2015); a comparison with Karampela et al.'s (2017) meta-analysis of the literature on sustainable local development clearly shows the dearth of such themes in "agro-", "agri-" and "rural" tourism. Similarly, alternative pathways towards it and comparisons between different cases should be addressed in future research.

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AGRICULTURAL PRICES AND MARKET STRUCTURE: HOW TO ACHIEVE ECONOMIC DEVELOPMENT THROUGH CO-PARTICIPATORY AGRICULTURE WHILE USING FEWER INPUTS TO THE LOCAL MARKET SEGMENTS IN DEVELOPED ECONOMIES

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ABSTRACT

This study will analyze an alternative path to usual agricultural management. Conventional agriculture has many agri-environmental issues to handle such as nearby pollution, biodiversity loss, eutrophication, etc. As such this study will introduce a co-participatory agricultural approach while a strategy for eco-efficiency will be developed for industrial reasons. Fundamentally, the study is concerned with the impact of agri-environmental issues on agriculture and how it changes the cost of production through necessary price adjustments. Also, the study is based on making the food market more resilient by certain reductionist approaches. In addition, the research investigates if co-participatory agriculture leads to more sustainable economic growth through prices adjustments or not. There is need to know if CSA is more cost effective as a development pathway. Secondly, it is also important to see if the reduction of LCA provides more products with less inputs as a robust food strategy. Thus, the objectives of the current study relate to CSA, that is, how agriculture can achieve earnings with external support that leads to organic production and on second thought to deliver cost savings in industrial agriculture by using less inputs to industrial activity. CSA may relate to qualitative research via focus groups, etc. while LCA relates to quantitative analysis as it has to do with a mix of raw materials that relate to the industrial production and need to be reduced at sustainable levels. In addition, the study expects to find if CSA is more sustainable to be applied in a community as it may bring along with profit, better subsistence and people convenience. Secondly, the study relates to how to define the threshold cost that the reduction of LCA can meet. This way we may learn that acting as usual is less justified and legitimized, as conventional agriculture pollutes the environment and also has many disadvantages such as exposing local farmers to unhealthy environments while breeding mono-cultivations, that confront many issues (like harmful moths, parasites, viruses and bacteria). Lastly, in terms of eco-efficiency, the LCA reduction steps, lead to less expenditures for the same product with the same matter and energy used and in line with an integration of both to the economic activity, for multiple

use of raw resources. For example tomato palms can be processed in many ways before and after the harvest as the production process can lead to a number of final products after adequate allocation to different industrial productive units, that is, production lines. So there needs to address both CSA and LCA for regional development in order to meet local demand. That will be a leverage approach to usual business.

KEYWORDS: sustainability, agriculture, management, analysis, products.

INTRODUCTION

This paper aims to address the organization of the food market in developed countries in terms of strengthening organic production and extend price adjustments at a premium level. The expectations have to do with the alteration of current productive regimes with new ones that are more advanced. The nature of the problem that made us to search for answers has to do with environmental crisis (Baker, S., 2005). The latter has to be researched to meet human and non human needs on this planet. So the problem/issue relates directly to agricultural throughput that needs to produce more with less (Lehner P., 2017) while indirectly relates to food security as there is need to meet global food demand (Brooks, J. et al., 2013). This demand, in order to be met, leads to the need for intra-generational equity, which as the "Theory of Justice" (Rawls, J., 1971) assumes as a related principle, the end products should be distributed to locations where are truly needed for the direct benefit of the least-advantaged members of the present generation (Glotzbach, S. 2009). However, the problem here has to do with the pattern of exploitation of local natural resources that relate to local agri-food systems. These systems which stay arranged until today in developed economies and are distinguished as extensive (i.e., land-intensive), labor-, and capital-intensive systems relate more accurately to conventional regimes thus staying usual from a development perspective (Enefiok E. et al., 2016). In contrast, the latter issue of development should happen via the pursuit of sustainable and equitable economic growth and development (C. Deller S., et al., 2017). As known from literature, looking at the LCA procedure is like searching for the real cost of food (Sieverding, H. et al., 2020). The point is to determine a cost threshold so that agriculture productivity is effective. Also, market structure that most of the times relates to oligopolistic schemes affects prices in the economy significantly (Severová L. et al., 2011) as local food market prices tend to increase mostly when agents are reduced (Singh, Vishal, Zhu, Ting., 2008). Hence, in terms of GDP growth it looks easier to retain sustainability at the local level through CSA, due to more simple exchanges as consumers form direct relationships with the farmers (Ostrom, Marcia, 2008). So what must be clarified relates to, how to minimize energy and matter to the industrial throughput from the reduction of product LCA and secondly how to maximize product prices via CSA so that GDP may become larger to that region thanks to the support of consumers. Here we will try to improve agriculture locally so that every developed country will benefit collectively as an end.

METHOD

Starting with the methodology section of this paper the action is actually twofold. First, there should be explained that LCA relates to all parts of agricultural production beginning from raw material extraction and reaching the recycling or final disposal of the materials composing it (T. Pajula, et al., 2017). So our task relates to reduce volumes of matter and energy used in the throughput in order to provide a better combination of relevant components to the process. Next, the study also distinguishes that a more advanced strategy in terms of food production may relate to CSA (Cone, Cynthia & Myhre, Andrea., 2000). Here the evaluation of co-participatory agriculture relates to finding if there is more sustainable growth through prices adjustments or not. There is need to know if CSA is more cost effective as a development pathway.

RESULTS AND DISCUSSION

After the research methodology realization, the study will provide new insights from the delivery of results (Cayla, J. & et al., 2014). It may infer that GDP growth depends mostly from local markets expansion when such markets in developed economies are linked with the largest share to CSA while LCA will deliver more products with fewer inputs, so integrating sustainability.

CONCLUSION

The study is concerned with the following expectation; to adjust agricultural prices at the local level so that, the

market will gain more benefits through CSA and observe if that may increase GDP significantly. Nonetheless, the need for eco-efficiency has led to the analysis of LCA within industrial agriculture (Pelletier, N., 2014). The result of LCA will give us a picture of how we can decouple embedded ecological capital from economic expenditures within industrial activity so that eventually we have profit maximization, planet protection and people better satisfaction in order to achieve TBL (Triple Bottom Line). As such, CSA and LCA seem to be leverage themes of contemporary ecological modernization.

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DOES REPUTATION MATTERS? EVIDENCE FROM INTERNATIONAL TRADE

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KEYWORDS: international trade, reputation, gravity equation model.

INTRODUCTION

International trade plays a significant role in the economic growth and development. Countries and companies that

are involved in exporting can achieve levels of growth that may not be possible if they only focus on their domestic markets. As a result, many managers and policy makers are looking for new ways to stimulate export volume. According to Dimitrova et al. (2017), increasing exports is a global imperative, yet the challenge remains daunting.

While the trade literature has identified contributing factors to exports such as the geographic distance between two countries, the size of the two markets, free-trade agreements (FTA) between the countries, and the presence of a common language and colonial ties (Anderson and van Wincoop, 2004), these factors are difficult to manipulate unilaterally. For instance, a country cannot simply change its location or its official language. Even, while potentially powerful, require considerable negotiation, and depend on the importing country to accept the terms of the free trade agreement.

To enhance export volume, some governments have turned to country reputation, and more specifically country-of-origin (COO) effects, as a possible solution. A high level of trust and commitment is crucial for the quality and the long-term success of the import-export relationship, since it plays a key role in building and maintenance relationships, especially in international market exchanges characterized by greater uncertainty (Bianchi and Saleh, 2010).

The main aim of the current research is (a) to demonstrate empirically that country of origin perceptions do in the agricultural sector level, meaningfully contributing to actual trade volume (b) to compare agricultural and non-agricultural (manufacture, machinery and transportation equipment, as well as chemicals) effects on trade volume taking into account the differences of substitution elasticities among the sectors.

METHODOLOGY

In order to identify the relationship between countries' image and trade volume for main trade sectors like agriculture, manufacture, machinery and transportation equipment as well as chemicals, a gravity equation model is pursued. To obtain sound econometric estimates, we adopt the latest developments in the empirical gravity literature. The estimation method have been used is the Poisson pseudo maximum likelihood (PPML). According to Santos Silva and Tenreyro (2006) the Poisson pseudo maximum likelihood (PPML) regressions can solve the zero omitted problem faced by the conventional log-normal OLS specification of the gravity equation and are robust to heteroskedasticity.

For each one of the studied sectors, a separate estimation is derived. Mutual trade flows data were extracted from the United Nations Comtrade Database. GDP and population data was derived from the World Development Indicators of the World Bank section. The values of mutual trade flows and GDP that compile our dataset are expressed in current US dollars. The values of mutual trade flows were deflated using the US Consumer Price Index (CPI: 2016=100) issued from the US Bureau of Labor Statistics. GDP values were also being deflated using US CPI. The distance data were calculated as great circle distances in kilometres between capital cities and were derived from CEPII. Information about the current preferential trade agreements in force was obtained from WTO's report 'Regional Trade Agreements, Facts and Figures', World Trade Organisation. Data for binary variables that represent common borders, common language and landlocked countries were derived from CEPII.

Consistent with prior research and with our definition of country reputation, we measure both country reputation for products and country reputation for people with a ranking taken from the Anholt-GfK Roper Nation Brands Index data set (Anholt, 2008 b). The ranking is based on surveys of over 20,000 people in 20 countries. Respondents rated 50 other countries including the 20 that were surveyed, producing a 20 × 50 data matrix. The "products" dimension ranking is based on respondents' perceptions of: the effect of a product or service's COO on people' attitudes toward purchasing it, the country's perceived contribution to innovation in science and technology, and the degree to which the country is seen as a creative place with cutting-edge ideas and new ways of thinking. The "people" dimension is based on the following questions: if I visited the country, the people would make me feel welcome, I would like to have a person from the country as a close friend, and a well-qualified person from the country would be a valuable employee.

RESULTS

According to the results, a country's reputation for products (in a target country) is positively related to its volume of trade to the target country. More specifically, a country's reputation for products has a positive and statistically

significant effect on trade volume for all of the investigated sectors (agriculture, manufacture, machinery and transportation equipment sector, as well as the sector of chemicals).

It is worth noting, that the effect of products reputation on trade volume is more pronounced in industries with more heterogeneous goods (lower elasticity of substitution). Thus, for example, the two largest reputation estimates at the industry level are for two of the sectors with the lowest elasticities of substitution, namely manufacture and machinery and transportation equipment. On the other hand, agricultural goods tend to be quite substitutable (higher elasticity of substitution).

Additionally, results indicate that the reputation for people (in a target country) is positively related to its volume of exports to the target country. We find little support for this prediction. We only obtain two estimates at the agricultural sector and the sector of chemicals that are statistically significant. This fact can be attributed to the fact that manufacturing products and products of machinery and transportation equipment require sophisticated engineering knowledge and skills.

CONCLUSIONS

According to results, the relationship between country reputation and trade volume is a substantive and empirically valid topic of study. Our findings have implications for scholars, business leaders and policy makers:

The most obvious implication for scholars is that the current paper introduces the gravity equation model to the management and marketing literature. We believe that the gravity model may also be helpful in researching other contributors to bilateral trade. Additionally, in the present paper the reputation for products and people varies across countries, thus going beyond COO research which has treated product quality perceptions based on COO as uniform across consumers from different countries. By this way, we are able to examine the impact of bilateral reputation on bilateral trade concerning the reputation of the exporting country in the importing country rather than exporting country's reputation in general.

A key implication for business leaders is that individual firms in various sectors of economic activity, where product reputation seems to have the greatest impact on trade, should work hard to build a strong reputation for producing high-quality products so as to help improve the overall reputation of the industry for producing high quality, reliable products and, thus to reduce product quality uncertainty. Similarly, firms in industries that require intense human capital (e.g. agriculture) should focus their efforts on enhancing the reputation for people in these industries so as to reduce relationship uncertainty for potential importers.

Last but not least, public policy makers looking to stimulate exports to a specific country, improving their respective country's reputation in that country appears to be a viable alternative to other levers (e.g. trade negotiations, FTAs). We advise government officials to invest in every sector primarily in building a strong reputation where uncertainty is present and risk is a potential obstacle to trade.

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PRODUCTS WITH GEOGRAPHICAL INDICATIONS AND PUBLIC GOODS: LADOTYRI MYTILINIS

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ABSTRACT

The research aims to determine the public goods provided from the value chain of PDO cheese 'Ladotyri Mytilinis'. For this purpose, interviews were conducted with stakeholders of primary production. The cheese is mainly made from sheep milk of the local Lesvos breed, contributing to the protection of the farm animal genetic resources. The breed grazes on the native pastures, giving the product unique organoleptic properties. Ladotyri Mytilinis contributes to the creation/maintenance of many jobs, income, and added-value. Accurate specification and documentation of the public goods provided may contribute to the upgrading and sustainable development of the value chain.

KEYWORDS: public goods, ladotyri Mytilinis, value chain, added-value.

INTRODUCTION

There are untapped development opportunities for the products of Geographical Indications (GI). Of particular importance is the upgrading of their value chains, highlighting the positive external economies and public goods (PG) produced (Vandecandelaere et al., 2009· Belletti et al., 2017, Arfini et al. 2019). The aim of the research is to determine the contribution of Ladotyri Mytilinis on the provision of PG and more specifically: a) to the creation/maintenance of jobs, b) to the creation of added-value across the entire relevant value chain, c) to the achievement of a satisfactory standard of living for those involved, d) to the protection/preservation of local biodiversity and the local sheep breed, e) to the positive effects of extensive production systems. The research shows that Ladotyri has a very positive contribution to all of the above PGs, except the partial degradation of pastures, which offsets the positive effect of the endemic flora on the grazing and feeding of animals.

METHODS

A full technical-economic analysis was carried out, based on data from interviews with the heads of two livestock cooperatives and five breeders of Lesvos, which took place in March 2020. Also, a literature review was carried out in the Google Scholar and Scopus databases. The main object of research is the provision of PGs, through the utilization of products of Geographical Indications.

RESULTS

Sheep and goat farming and olive growing are the dominant sectors of primary production in Lesvos. Sheep farming is usually done in the context of mixed farming systems, with sheep, olive groves, and / or goats and / or self-produced feed; 95% of the sheep population on the island belongs to the local Lesvos breed. The breed is abstemious, adapted to the island's geomorphological conditions, resistant to the diseases, with high milk yields, after the recent implementation of a genetic improvement program in some farms. Local cheesemaking businesses process 85% of the milk to the production of cheese. In 2017, the production of Ladotyri Mytilinis amounted to 460 tons, showing strong growth trends after 2010 (ICAP, 2019). Sheep and goats graze all year round in olive groves or pastures. The cultivation of olives takes place on terraces, with the main cultivated varieties being 'Valanolia' and 'Adramyttiani'. The pastures of Lesvos are considered barren, of low productivity

and grazing capacity, with Astivi and Ladania as the dominant plant species. Pasture covers about 10% of the animal nutrient requirements. The self-produced feed is not sufficient in quantity, while the purchased feed is expensive due to the high costs of transportation.

Table 1. Annual employment within the examined livestock farms

Farm	Annual Employment Within Farm			Annual Employment Within Farm		
	Family AWUs*	Non-Family AWUs	Total AWUs	Family AWUs	Non-Family AWUs	Total AWUs
1st	3.44	0.75	4.19	82.1%	17.9%	100.0%
2nd	1.92	0.10	2.02	95.0%	5.0%	100.0%
3rd	1.89	0.15	2.04	92.6%	7.4%	100.0%
4th	2.21	0.19	2.40	92.1%	7.9%	100.0%
5th	1.69	0.17	1.86	90.9%	9.1%	100.0%
Average	2.23	0.27	2.50	89.1%	10.9%	100.0%

(*) AWU: Annual Work Unit
Source: Field research

Table 2. Main financial results of the examined livestock farms

Farm	Sheeps	Ewes	Milk per ewe and lactation period (kg)	Milk price (€ per kg)	Gross Revenue with subsidies per kg of milk	Intermediate Inputs per kg of milk	Farm Family Income with subsidies per kg of milk	Gross Value Added per kg of milk	Net Value Added per kg of milk
1st	418	330	245	0.80	0.96	0.60	0.24	0.37	0.25
2nd	168	130	300	0.80	0.86	0.24	0.55	0.63	0.55
3rd	271	220	205	0.80	0.87	0.76	0.00	0.11	0.01
4th	306	250	188	0.84	0.92	0.79	0.03	0.13	0.05
5th	138	100	200	0.84	0.96	0.36	0.49	0.61	0.50
Average	260	206	225	0.81	0.92	0.59	0.22	0.33	0.23

Source: Field research

DISCUSSION

Ladotyri utilizes two emblematic products of the island, i.e., sheep milk, and virgin olive oil, which come from the semi-extensive sheep-farming and extensive olive production system, respectively. Increasing production of Ladotyri is accompanied by an increase in total value-added along its value chain, in which farmers accounted for about 35% in 2019. Ladotyri is closely anchored with the terroir and is made from sheep milk of indigenous farm animal breeds. The examined livestock farms employ, on average, more than three times human labor than the average farm in the country, of which 89.1% comes from family members. They create added-value, amounting to € 0.33 per kilo of sheep milk, ensuring a high agricultural family income, two-thirds of which comes from the market. All farms, except one, secure a completely satisfactory standard of living to their members. The best economic results are achieved by farms with high milk yield and/or high milk price, combined with the lowest

intermediate inflows per kilogram of milk. The highest milk yield comes from the participation of a farm in a genetic improvement program of the local breed. Smaller farms better manage the flock, achieving higher milk production per animal. The local sheep breed of Lesvos has prevailed over foreign imported breeds, contributing to the preservation of genetic resources and the containment of feed costs, because they are abstemious and cover some of their needs through grazing. Using a disease-resistant breed can reduce the cost of veterinary care. The applied production system does not require high initial installation costs, while animals of high production capacity have a positive effect on added-value. Growing olives on terraces protect soils from erosion. The shortage of agricultural land except for the olive groves, as well as its fragmentation, hamper the self-provision of feed and the necessary re-grass of the pastures. Proper pasture management is suggested to address agricultural degradation and desertification.

CONCLUSIONS

The findings of the research show that the interconnection of the Geographical Indication products with the local complex agri-food systems can contribute to the provision of PGs, implying significant economic, social, and environmental benefits. The scientific documentation of these PGs is an integral part of the effort to create a special identity of this product and, consequently, to the utilization of its unrealized potential. Continuing on-site research with more interviews with farmers, cheesemaking businesses, and commercial enterprises will allow for complete documentation and more valid results.

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8th INTERNATIONAL SESSION
POSTER SESSION

CHAIRPERSON: Katerina Melfou (UWM)

- **Foteini Kyriazi, Dimitrios Thomakos & Efthymios Xylangouras**
  [ID: 202150] Determinants of forecastability of Greek agricultural output
- **Stavros Kalogiannidis, Fotios Chatzitheodoridis, Katerina Melfou & Achilleas Kontogeorgos**
  [ID: 202138] Agricultural products and foodstuffs marketing. Consumption trends

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DETERMINANTS OF FORECASTABILITY OF GREEK AGRICULTURAL OUTPUT

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INTRODUCTION

Forecasting agricultural output is a determinant factor of the financial and tradeable markets. Agricultural output do generally vary with global economic trends and are believed to influence price levels more broadly and thus are of interest to central banks, policy makers, firms and consumers. On the other hand, agricultural productivity is very vulnerable generating important economic problems to the farmers and the consumers. Thus, it is of considerable interest to examine how we can achieve forecastability of agricultural output. The magnitude of this issue is to assure that there will be knowledge for the governments so as to implement appropriate trade policies as well as for the farmers' adequate market information.

LITERATURE REVIEW

Forecasting the prices of agricultural commodities, whether in terms of their tradable futures or in terms of price indices, is a problem that is of considerable practical significance, as the volatile nature of agricultural products makes them susceptible to a higher degree of uncertainty. Forecasts of agricultural production and prices are intended to be useful for farmers, governments, and agribusiness industries (Allen, 1994), but are also of interest to central banks, policy makers, firms and consumers whose decisions depend on their expectations of future inflation (Groen & Pesenti, 2011), since agricultural commodity prices do generally vary with global economic trends (Zhang, Lohr, Escalante, & Wetzstein, 2009) and are believed to influence price levels more broadly as well. Furthermore, agricultural productivity is very vulnerable and depends strongly on the varying weather conditions from season to season and from year to year (Supit, 1997), as well as on the morphology of the land, the diseases that hit the crops, and the state of the local, regional, national and international economies, thus generating important economic problems that need to be addressed by the decision making of farmers and consumers. Such an increased variability across time and space suggests that forecasts can be used as part of agricultural monitoring systems (Atzberger, 2013). Thus, the question of the forecastability of agricultural output is of considerable interest, from many perspectives, and the nature of the products suggests a number of explanatory variables that could be used for the generation of such forecasts. For instance, early warning in case of anomalous seasons (e.g., owing to severe heat and water

stress) may enhance the capacity of regional and national decision makers to assure food imports and regulate the agricultural market (Bannayan & Crout, 1999).

DATA

Our dataset stemming from the official website of the Greek Statistical Authority (ELSTAT), a national independent organization of Greece, which is responsible–among other operations–for the construction and the provision of various economic statistical reports. Due to this responsibility of ELSTAT we use from its reports the following economic variables, the Total Agricultural Output, Total Agricultural Input and Retail Sales Turnover. As the data frequency plays an important role in determining price transmission (Nazlioglou, 2011) and the economic variables are available at a monthly frequency, we constrain ourselves to the use of monthly observations that span the period 2000 to 2019. Due to data length constraints, we use two rolling windows of 36 and 60 for estimating the parameters of our models. All our variables enter in the analysis as annual growth rates.

RESULTS

We start off our discussion with some general remarks on the three tables. The tables focus on the relative performances of the top three models based on the RMSE and MAE rankings. We can immediately see that the following results appear to hold robustly:

1. We report on the top 3 models based on the evaluation criteria, all of the top models include explanatory variables.
2. We illustrate Total Agricultural Input, Retail Sales and Fixed Capital Input as our explanatory variables.
3. There are signi ficant forecasting improvements over the AR(1) forecast, which we use as benchmark, of a magnitude of around 10% for the RMSE and of between 10% and 35% for the MAE – and this result holds across the two rolling and the recursive estimation windows.
4. The top 3 models offer comparable forecasting performance (in terms of the magnitudes of the evaluation criteria).
5. Individual explanatory variables appear almost exclusively, compared to principal components of the explanatory variables that appear only in one model.
6. The adaptive learning procedure offers from mild to considerable performance improvements over the top 3 models being presented.

CONCLUSIONS

We illustrate the value of economic activity variables in forecasting agricultural output. We also find that Total Agricultural Input, Retail Sales and Fixed Capital Input have considerable explanatory power for forecasting agricultural output. Adjustment government programs can benefit form these findings and find them very useful for major macroeconomic and sector-specific policy change. The results show that forecasting agricultural output can be an important component for the farmers in order to raise agricultural growth.

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ANNEX

Table 1. Benchmark models

Model	Explanation
$AR(j)$	The $AR(j)$ forecast, with $j = 1, 2, 3, 4$
$AR(p)$	The $AR(p)$ forecast, p by the AIC
$MA(j)$	The $MA(j)$ forecast, with $j = 1, 2, 3, 4$
$ARMA(1,1)$	The $ARMA(1,1)$ forecast
ADL-NS	The adaptive learning forecast, no smoothing
ADL	The adaptive learning forecast, with smoothing
$TI(-p)$	Total Agricultural Input with p lags
$RS(-p)$	Retail Sales with p lags
$CONSI(p)$	Consumables Input with p lags
$FCI(p)$	Fixed Capital Input with p lags
Fj	jth Principal component factor

Table 2. Recursive Window: Top 3 models for RMSE & MAE

Model	RMSE	RMSE adaptive	Model	MAE	MAE adaptive
MA(2)/TI(-1)/RS(-1)	0.885	-	MA(2)/FCI(-1)	0.644	
MA(2)/TI(-1)	0.885	-	AR(1)/TI(-1)	0.659	-
MA(2)/F2(-1)/F2(-2)/F2(-3)	0.891	-	ARMA(1,1)x(0,1)/FCI(-1)	0.661	
ModelAvgRMSE	0.874	-	ModelAvgMAE	0.591	

Table 3. Rolling Window 60 Top 3 models for RMSE & MAE

Model	RMSE	RMSE adaptive	Model	MAE	MAE adaptive
ARMA(1,1)x(0,1)/FCI(-1)	0.908	0.904	ARMA(1,1)x(0,1)/FCI(-1)	0.905	-
ARMA(1,1)x(0,1)/FTI(-1)	0.912	0.904	ARMA(1,1)x(0,1)/TI(-1)	0.909	0.901
ARMA(1,1)x(0,11)/CONSI(-1)	0.914	0.908	ARMA(1,1)x(0,1)/CONS(-1)	0.913	0.901
ModelAvgRMSE	0.905	0.899	ModelAvgMAE	0.897	0.894

Table 4. Rolling Window 36: Top 3 models for RMSE & MAE

Model	RMSE	RMSE adaptive	Model	MAE	MAE adaptive
AR(2)_TI(-1)/RS(-1)	0.913	-	ARMA(1,1)x(0,1)/TI(-1)	0.892	-
AR(3)/TI(-1)/RS(-1)	0.915	-	ARMA(1,1)x(0,1)/FCI(-1)	0.892	0.885
MA(2)/TI(-1)	0.923	0.922	ARMA(1,1)x(0,1)/CONSI(-1)	0.896	0.892
ModelAvgRMSE	0.889	-	ModelAvgMAE	0.883	0.879

AGRICULTURAL PRODUCTS AND FOODSTUFFS MARKETING. CONSUMPTION TRENDS

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ABSTRACT

This paper gives a general view overview of the different trends associated with consumption, marketing, health and overall lifestyle for foodstuffs and agriculture with reference to Greece. This paper helps to synthesize the multi-faced elements or aspects of food and agriculture in the world particularly Greece. This paper contributes to the efforts of bridging the exiting gaps concerning the economics of food marketing and consumption, lifestyle and health trends, as well as food production in a bid to offer a meaningful resource for effective food marketing in the agriculture sector. Farmers require such information to clearly understand their prospective consumers sand the prevailing trends of consumption. This paper is also of great importance to consumers since it offers a better understanding of the different numerical implications associated with a particular diet.

KEYWORDS: agricultural products, foodstuffs, marketing & consumption trends.

INTRODUCTION

Agriculture is considered a fundamental sector for the world's food system since it determines the level of food security for different countries. The food system of a country such as Greece is used to clearly describe the different interdependent association that exist among the production, distribution and consumption of agricultural products or foodstuffs.

Increasing anxiety concerning the losses incurred by producers or farmers is to a greater extent causing customers and farm leaders to explore the food system's future health and viability. The Greek food system involves agricultural processing, as well as vertically organized producers, wholesalers, brokers, merchandisers, retailers, and financial institutions. This paper seeks to establish the key trends in the marketing and consumption of agricultural products and food stuffs particularly in Greece. There are guiding research questions that include;

Q1. What are the different marketing opportunities in Greece
Q2. What are the trends for foodstuffs and agricultural products in Greece
Q3. What are the consumer food expenditure trends
Q4. What forces are driving the consumption of foodstuffs in Greece

The country's food system is considered part of a broader, diverse economy and culture, the values and behaviors are reflected by the way farmers produce and sell to consumers.
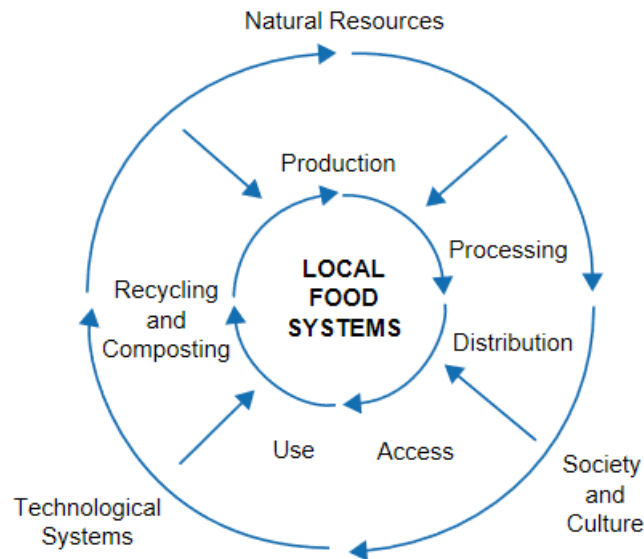
Figure 1. Local food systems

METHODS

A secondary research methodology was adopted for this study since it involved review of different past reports and publication to establish the different trends that are prevalent in the food and agricultural industry. Secondary research is concerned with the use if already existing data that can be accessed from several online data bases in the different journals, articles or books. The advantage of using secondary data is that it easy to access and can be obtained at a free cost as compared to other forms of data.

RESULTS AND DISCUSSION

Q1 Marketing opportunities in Greece

Table 1. Q1 Marketing opportunities in Greece

Variable	Description of opportunities
Profile of consumers for agricultural products and foodstuffs	Greek is comprised of a population of over 10.6 million people which is growing or increasing at a rate of –0.31%. The median age of Greece is 45.3 years and over 14.5% of the total inhabitants is under the age 14 years old. Furthermore over 10.3% of total population ranges between 15 and 24 years old and those with 65 years and above are 22.4%. Reports also indicate that for every 95 make there are 100 women.
Purchasing Power	The 2020 World Bank report shows that the GDP per capita of Greece is about USD 31,400. Furthermore, the average income per capita of Greek households is rated at USD 17,700 annually. This is approximately lower than USD 33,600 annually which is the OECD average.
Consumer Behavior	The spending habits Of Greek consumers have greatly changed since the economic recession whereby much concern is about the prices of products offered on the market.

Source: Greece-The Market (2020)

Q2 Foodstuffs and agricultural products consumption trends in Greece

Concerning terms of trade, reports indicate EU members such as Europe, Germany, Cyprus, and Italy, are the major trade partners of Greece for the food stuffs and agricultural products. This indicates that citizens of such countries also act a secondary consumers of the different agricultural products or food stuffs produced by Greece.

Reports indicate that the Greek food and agricultural sector has immensely grown over the last two decades and realized an increase in the market base both locally and internationally. For example between 2000 and 2005, over 34% of the Greek diet was majorly comprised of roots, cereals and tubers. However by 2015, the dependence on cereals, tubers, and roots had decreased to 25% and this trend is expected to continue over the next decades.

The current total value of the Greek food processing industry is over US$10 billion annually and this is attributed to more than 13.000 companies and enterprises that are operating in the country.
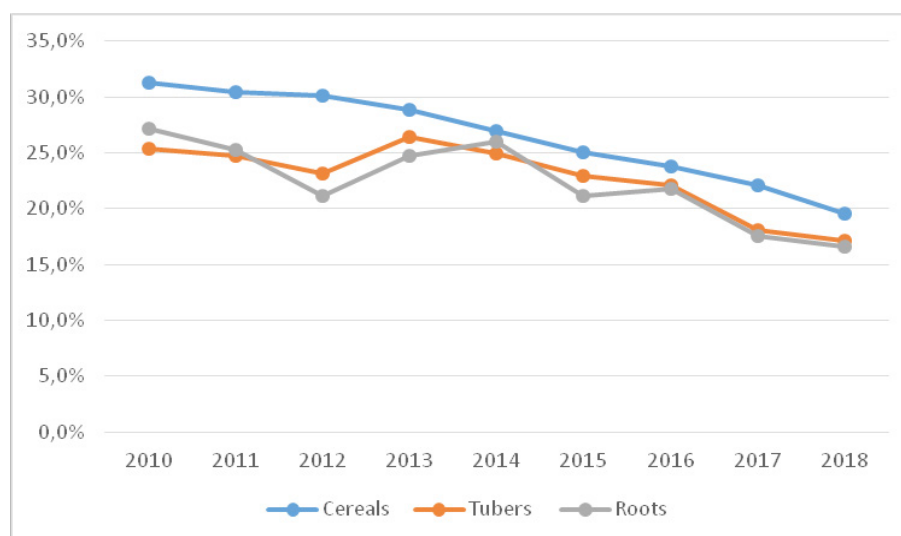

Figure 2. Greek Consumer trends of cereals, tubers, and roots 2010-2018

Source: Factsheet (2020)

Q3 Trends in foodstuffs' expenditure by consumers

The different economic choices undertaken by both consumers and the producers in any country's food system are key in influencing market trends fir the agricultural products and food stuffs. The consumer's food budget is also key to influencing market or consumption trends since it determines the level to which a customer purchase a particular product. Food spending, as a percentage of personal disposable income, dropped 4.2% points to 11.7 % in Greece from 2000 to 2020 .

Table 2. Food spending as a proportion of disposable personal income for past two decades

	2000	2020
At Home	11.7%	7.6%
Away from Home	4.2%	4.1%
Total	15.9%	11.7%

Source: Factsheet (2020)

Q4 Forces driving the consumption of foodstuffs in Greece

The trends in the Greek food system are influenced by consumer purchasing habits, perceptions, and demographic patterns. The rise in the food consumed in areas or places away from home, the increased use of packaged foods, and the general movement towards larger supermarkets are some predominant patterns. Yet, there are also several competing patterns:

- The total number of markets for the local farmers has continued to increase in Greece.
- The market for fresh fruits and vegetables in the Greece is continuously expanding.

CONCLUSIONS

Agricultural production and consumption of food stuffs has continued to evolve in Greece and the world as a whole. The trend of the market base has similarly evolved over the past two decades and continues to change based on the different forces that determine demand or level of consumption in Greece and on the global market. The study confirms that trends in the domestic market fir agricultural products and food stuffs is largely influenced by several social demographic factors including; age, household income, personal income of consumers, and several social cultural factors. However, the international market trend for food stuffs and agricultural products is being influenced by climate changes and increased globalization, as well as the political climate of the producing country.

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