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Land Diversification and Its Contribution to Farms' Income

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Abstract: Management and utilization of factors of production, in addition to diversification of land use, affect the performance of farms. In this article, it is identified whether the diversification of land use through its disposal to tourism infrastructure has a positive impact on the farms' income. This identification was conducted by processing technical and economic data and applying bootstrap regression analysis. The research was conducted using a sample of 56 farms active in hospitality alongside agriculture, utilizing possibly uncultivated areas of land. Data collection was carried out by personal visits to the examined farms. The results showed that the performance of the farms is enhanced by tourism activity. At the same time, the results showed that land used for tourism activities has a positive impact on farms' income. Paid labor also appears to have a positive influence. Although this investigation was executed in the Region of Central Macedonia (Greece), it contributes to strengthening the existing literature on rural tourism and land use. At the same time, it gives alternatives to policy-makers and owner-managers of farms regarding the utilization of the available factors of production with an emphasis on the land one.

Keywords: farm management; tourism; performance; bootstrap regression; non-coastal rural areas; Greece

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1. Introduction

It is widely accepted that agriculture is a vital source of income for rural populations, the economy of various countries, and the global economy [1,2]. That is a natural consequence since agriculture indicates how plants and animals supply the global human population with food and other necessary products [3]. These products develop by combining the three fundamental factors of production (land, labor, and capital) in specific places called farms [4,5]. The combination of these three factors of production creates costs and profits that constitute farms as technical and economic units [4,5].

As indicated in the literature, the elements of farms that are mainly studied are their size [6], structure, labor intensity, and land use [7], as well as the produced products [8,9] and their economic results [5,10]. Of great interest among the wide range of studies [11] is also the terms of diversification. Diversification has sometimes been a central issue of the Common Agricultural Policy (CAP) [12–14]. More specifically, according to [14,15], it is shown that "*countries and regions have allocated 7.4% on average of total public expenditure to the measure dedicated to farm and business development, which includes, inter alia, support for farm diversification*". Concerning the new programming period (2023–2027), novel investments seem to be planned regarding farm diversification in terms of production and non-agricultural activities [16].

Diversification is a strategy that increases the goods and services produced on the farm and sold in the market [14]. Alternatively, diversification is considered a provision of non-agricultural services such as tourism and energy production [14]. Lastly, a particularly

well-favored avenue of diversification [17] is tourism [14,18–30] which seems to be utilized by many farm owner-managers to create opportunities to generate additional income and improve their life quality [20,31,32].

More specifically, the importance of this type of diversification—provided through non-agricultural activities—lies in the possibility of supplementing the income generated by the farm with income generated by the provision of tourism services [33]. Another reason why farm leaders become pressured to provide this type of service is to ensure sustainability at the level of farms and area level [24,34], the location (disadvantaged or non-) [26], the stagnation [25], the increasing economic pressure [19], and the market variance [35].

A substantial body of literature has studied the factors influencing the adoption of diversification activities [13,14] as well as the level of participation in non-agricultural on-farm activities [12]; however, little attention has been given to the impact of such adoption on technical efficiency [27,34], economic sustainability [36], and economic performance of farms [37]. Various studies within the relevant literature also investigate how tourism and agriculture contribute to the total income of farms [14,22,23,25,26,29,32,33,38]. However, regarding the current investigation, the context of land diversification with its disposal in tourism infrastructures seems deficient in literature references. Therefore, this paper attempts to answer whether this form of diversification of land use (location of service facilities) positively impacts the income of farms in Greek regions. Such an investigation is believed to fill a relevant literature gap by providing alternatives to policy-makers and owner-managers of farms regarding the utilization of the available factors of production with an emphasis on the land one. To achieve the previously mentioned research purpose, the authors surveyed several farms that remain active in the tourism sector [14,22,23,25,26,29,32,34,38]. The collected data were of a technical and economic nature [4,5,27,39], and bootstrap regression was the analysis method used.

The following part of this article expands into six sections. Firstly, a review of previous studies related to the subject of this paper takes place (Section 2). Then follows the description of the study area, the research process, and the method used for the analysis (Section 3). Finally, the description of the results (Section 4), their discussion (Section 5), and the conclusions explaining the originality and limitations of this essay follow (Section 6).

2. Literature Review

Through the presentation of literature studies relevant to the subject of this article, the authors aim to highlight the concerns that arose and resulted in the formulation of the research purpose. As mentioned in the introduction section, several studies investigate how tourism contributes to the total income of farms.

Khanal and Mishra [22] showed how farm income could potentially differ from the approach of agritourism and off-farm work, as well as the analysis of the factors that can influence the adoption of such choices. To carry out this research, the Multinomial Logit Model (MNL model) was applied to secondary data from the US statistical services. The research results showed that small farms that use strategies to diversify their income through agritourism receive a higher total farm household income than larger farms [22]. Regarding this specific issue [38], aimed to evaluate how developing agritourism businesses impact US farm profitability through secondary data. For the execution of this investigation, the Propensity Score Matching technique was deployed. The research results in this study also indicated that small farms have positive and statistically significant effects on profitability [38].

The opposite conclusions were obtained in Greece through personal interviews with 74 owners of agritourism businesses [23]. To be more precise, ref. [23] aimed to investigate the various profiles of managers and the influence of the socio-economic characteristics that affect the efficiency of agritourism businesses. Using categorical regression (CatReg), the contribution of agritourism was found to enhance agricultural incomes, despite the low level of participation of local farmers [23]. Concerning livestock farms, a study was carried

out in the Czech Republic [25], aiming to find different income diversification strategies in a sample of 28 farms. In this paper, scenarios were simulated on three different farm sizes. This study concludes that diversification of the agrotourism form can improve economic performance despite the size and bring long-term benefits even in quarantine periods [25].

A related analysis [32] conducted in Thailand examines how agritourism can benefit farmers. The analysis was executed by collecting data from various sources: interviews and records of various government agencies. The data were entered into a database that included the costs and gross revenues of each agritourism enterprise. The database was created for use as a matrix table, with the ultimate goal of examining the various interactions between the elements of the analysis. The results showed once again that the benefits of agritourism do not impact farmers alone, but society in general through employment opportunities in the tourism service sector [32]. One more study [26] investigated the evaluation and contribution of agritourism to the farm output of multifunctional farms located in Sardinian less favored areas (Italy). As part of the research, 18 agritourist businesses and a sample of 15 farmers were selected to provide financial information about their agricultural and entertainment activities. A balance sheet analysis took place to obtain farm output information. The results do not indicate whether agritourism affects the performance of specific farms, highlighting the difficulty farmers face in rewarding their labor at market price levels and gaining profits [26].

On the subject of farm diversification, [14] attempted to introduce empirical evidence on the impact of non-agricultural diversification on Italian farm income. The authors deployed national data from 15,179 farms to which an instrumental variable panel model was applied. The results confirmed the positive impact on farmer income through different diversification strategies, reducing that uncertainty in periods of instability and enhancing family income [14]. Later [29], investigated the decisive factors between farmer participation in non-agricultural activities and their effect on total household income. A total of 3866 households were selected, and their data, which related to the periods 2011–2012, 2013–2014, and 2015–2016, were collected. The two-stage Heckman method was applied to obtain the results. In the first stage, probit analysis was performed, while during the second stage, the outcome equation was based on the binary probit model. The result from the investigation once again emphasized the positive effect on household incomes after engaging in non-agricultural activities [29].

The extensive review of the above empirical studies leads to the conclusion that the contribution of tourism to the economic performance of farms—expressed as income, output or profitability—has been investigated sufficiently. However, the gap regarding the context of land diversification for its disposal in tourist infrastructures is once again noticeable. With that in mind, the authors chose to investigate whether the diversification of land use through its disposal to tourism infrastructure positively impacts the farms' income. This research was carried out by collecting primary data [23,25,26] from small family farms, as similar studies implement. The family type of farms is selected since family businesses dominate the hospitality sector [40–42]. After all, as well as from a macroeconomic perspective, SMEs have been shown to dominate the business sector of any country, and hence their cumulative effect is far from negligible [43–45]. Furthermore, the present investigation focused on farms that are also active in the tourism sector and are located in non-coastal rural areas of the Central Macedonia Region (Greece), as similar studies are limited in the context of the relevant literature.

3. Materials and Methods

3.1. Study Area and Data Collection

A survey, as mentioned before, was carried out in the Central Macedonia Region to fulfill the purpose of this study and lasted approximately six months (from November 2018 to May 2019). This survey was directed toward 56 small family farms located in non-coastal rural areas (50 villages) and active in the tourism sector. Technical and economic data were collected, as suggested by [4,5,27]. The choice of farms located in non-coastal areas was

made due to the need to maintain the population in these areas and to develop tourism models adapted to the new conditions—except for the diptych of "sun-sea"—as they were formed after the Greek economic crisis [27]. Bootstrap regression was deployed for data analysis, as presented in detail in the following subsection. These farms dwell in non-coastal rural areas of the Central Macedonia Region (Figure 1). This region is Greek and presents plenty of resources (such as lakes, rivers, mountains, and more) that, if utilized, could aid in making the development of alternative forms of tourism possible [46].

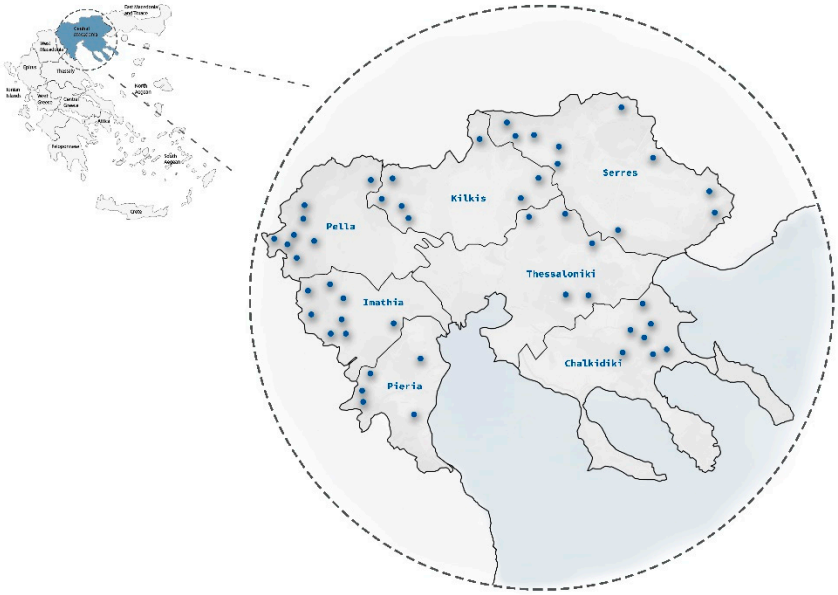

Figure 1. The study area (Region of Central Macedonia). Source: Edited Google Maps (2023).

In 2018, the Gross Domestic Product of the Central Macedonia Region accounted for 13.84% of the total national GDP, ranking it second among the other Greek regions [47]. The primary sector of C.M. participates by 26% in the Gross Added Value at the national level primary sector [48] as the cultivated area, according to the [49], reaches 5,423,124.3 acres covered by arable crops, vines, woody crops, greenhouses, and other crops. A related study [50] showed that in 2018, the Central Macedonia tourism sector participated in the national GDP at a rate of 12.4%. Tourism revenues in 2021 represented 10% (1.3 billion) of the country's total revenues, while the direct contribution of tourism to the region's GDP amounted to 5% [48]. With these factors in mind and given that Central Macedonia constitutes the largest of 13 administrative regions in Greece [27], it is crucial to support its qualification as a study area for the subject under consideration.

3.2. Bootstrap Regression

The bootstrap regression was applied to determine the impact each variable has on the total income. In order to fully understand the reasons why the authors of this paper were led to this choice (Bootstrap Regression) it is first and foremost necessary to quote a few comments about the multiple linear regression model. Suppose that the following multiple linear regression model is set as [51]:

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_p x_{ip} + \varepsilon \quad (1)$$

where, for $i = n$ observations, it exists that y_i is the dependent variable, x_i are the independent variables, β_0 is the constant term, β_p are the coefficients, and ε are the residuals [51].

The main goal of linear regression is to investigate the relationship between the parameters and the dependent variable [51]. In this particular article, the variables used are all expressed in monetary units. Specifically, the dependent variable is the total income (EUR) while the independent variables are the imputed rents (EUR), the total operating

costs (EUR), the expenses for the hired labor regarding the tourism activity (EUR), and the corresponding of the farm ones (EUR) (Table 1) [4,5,23,27].

Table 1. Variables' explanation.

Variables	Type of Variable	Description	Measurement Unit
		Dependent variable	
Total Income	Continuous	The sum of incomes from tourism and agricultural activities	€
		Independent variables	
		Agriculture	
Land	Continuous	Imputed rent: The product of the value of owned land acres and 3%.	€
Labor	Continuous	The product of the paid labor hours and the hourly pay rate	€
Capital	Continuous	The sum of expenses in raw materials: seeds, plant protection products, fertilizers, fuel, and machinery rental costs.	€
		Tourism	
Land	Continuous	Imputed rent: The product of the value of owned land acres and 3%.	€
Labor	Continuous	The product of the paid labor hours and the hourly pay rate	€
Capital	Continuous	The sum of the operating costs (electricity, heating, water distribution, phone services, transport fuels, catering, and activity costs)	€

€: EUR.

The analysis of this model points out the variables with the most influence. At each stage of this model's construction, the used parameters were checked for their validity through the correlation coefficient, significance level, and standard error. Additionally, it was found that there is a low correlation between the variables which is confirmed at a significance level lower than 0.05 ($p < 0.05$) [51]. Linear regression is effective under certain conditions such as the normal distribution that must be followed by the variables. After a normality test of Kolmogorov–Smirnov variables, it emerged that—in this specific data set—no variable follows the normal distribution [51]. Due to the fact that these assumptions had to be avoided, the authors chose to use bootstrap regression because it allows thousands of estimations to be performed and does not violate the assumption of normality [52]. To be more precise, Bootstrap Regression allows thousands of iterations that lead to the generation of a new asymptotically normal distribution with respect to the research sample. Bootstrap is a random sampling methodology with replacement. It is an approach that aims to test the stability of the regression coefficients [52]. The algorithm used in this paper is the following [52]:

1. Suppose that (X_i, Y_i) are two variables that follow a different distribution F from the normal one.
   For the distribution, F are defined as
   $$E_F\left[XX^T\right], E_F[X{\cdot}Y] \text{ with } (X, Y) \sim F \quad (2)$$
   where it follows that:
   $$\beta(F) = \left(E_F\left[XX^T\right]\right)^{-1} E_F[X{\cdot}Y] \quad (3)$$
2. Indeed, the least squares estimator is $\beta\left(\hat{F}_n\right)$ where $\hat{F}_n$ is an empirical distribution of n observations from F.

Subsequently, in order to boost gradually the sample is defined:

$$\beta(\hat{F}_n) \rightarrow \beta(F) \; and \; n^{1/2}(\beta(\hat{F}_n) - \beta(F)) \rightarrow N(0, \Sigma(F)) \quad (4)$$

where $\Sigma = \Sigma(F)$ is a covariance table based only in F.

3. Lastly, regarding the variance of the least square estimator, it applies that:

$$\left(X^T X\right)^{-1} Var(X \cdot Y) \left(X^T X\right)^{-1} \quad (5)$$

where for a random X and a large n it follows that:

$$\frac{1}{n}\left(E_F\left[XX^T\right]^{-1}\right) Var_F(X \cdot Y) \left(E_F\left[XX^T\right]\right)^{-1} \quad (6)$$

The above-mentioned algorithm was implemented using the R Software Version 1.3.1093. Through the use of this programming environment, the algorithm was executed 1000 times which resulted in a boost to the sample.

4. Results

In this section, the demographic and economic characteristics of the activities of owner-managers and farms are presented. Lastly, the results of the bootstrap regression analysis are presented and analyzed.

4.1. Characteristics of Owner-Managers

Most of the farm owner-managers that participated in the current survey are men, aged 47 years on average, married with a child, while their family usually consists of three adult members (Tables 2 and 3). Most respondents answered that they have approximately 24 years of experience in agriculture and 15 years in tourism.

Table 2. Demographic characteristics of Owner-Managers.

Characteristics	Average	St. Dev.	Min	Max
Age (years)	47.0	9.4	23.0	68.0
Adults (number)	3.0	1.8	1.0	12.0
Children (number)	1.0	1.1	0.0	5.0
Experience in tourism (years)	15.0	6.2	4.0	30.0
Experience in Agriculture (years)	24.0	9.4	4.0	40.0

Table 3. Characteristics of Owner-Managers.

Characteristics	Percentage (%)
Sex	
Men	64.0%
Women	36.0%
Marital status	
Unmarried	15.0%
Married	85.0%
Foreign Languages	
Yes	62.0%
No	38.0%
Tourism education	
Yes	56.0%
No	44.0%

The participants' education level is not necessarily high, as only 20.0% of those surveyed are university graduates (Figure 2). Regarding their education in tourism, 56.0% of them have received relevant training, and 62.0% speak at least one foreign language.

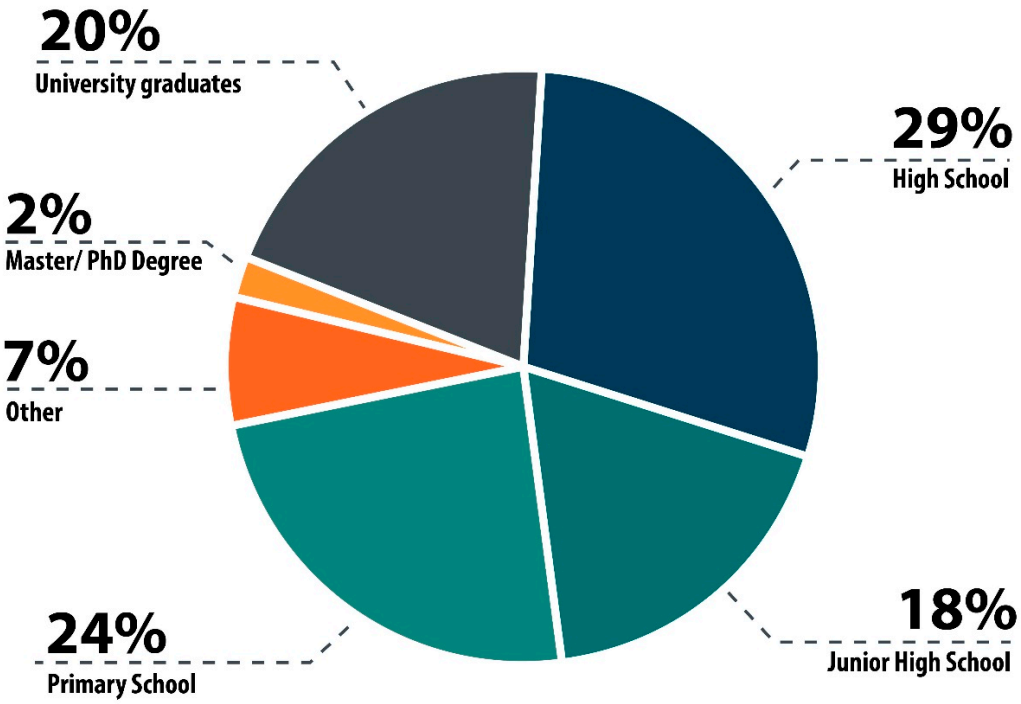

Figure 2. Education level.

4.2. Characteristics of Agricultural and Tourist Activities of Farms

The total number of 56 farms have an average of 76 acres of total agricultural area and 3727.0 sq.m. surface where the tourist infrastructure is installed, with buildings of an area of 553.0 sq.m (Table 4). In total, 36.0% of the farmers also use the tourism facilities as their permanent residence, while the other percentage operate in facilities independent of their primary dwelling (Table 5). Almost half, 49.0%, of the farms offer only hospitality activities, while 51.0% provide additional activities such as catering and Cafes with a capacity of approximately 48 seats. The accommodations have the ability to capacitate an average of nine rooms and operate 308 days a year (Table 4).

Table 4. Characteristics of Agricultural and Tourism Activities.

Characteristics	Average	St. Dev.	Min	Max
Total Agricultural Area (acres)	76.0	116.3	5.0	720.0
Plot Surface (sq.m)	3727.0	7891.0	130.0	45,000.0
Surface area of building facilities (m^2)	553.0	502.1	100.0	3000.0
Rooms (number)	9.0	4.3	2.0	19.0
Seats (number)	48.0	101.0	20.0	400.0
Operating Days (number)	308.0	93.9	50.0	365.0

Table 5. Type and Services of tourism activity.

Characteristics	Percentage (%)
Type	
Main Residence Department	**36.0%**
Independent of the main residence	**64.0%**
Services	
Hospitality (only)	**49.0%**
Hospitality and Catering	**51.0%**

Regarding the economic characteristics of the farms, the average revenue is EUR114,124.5, where EUR82,742.4 (72.0%) arise from tourism activities, with the remaining EUR31,382.1

(28%) from agricultural ones (Table 6, Figure 3). The—farm—capital required is presented through variable costs and amounts to EUR8453.0. The land requires approximately EUR2362.8 per year via imputed rent, while paid labor gets remunerated with EUR2712.1 per year. Operating costs of tourism activity reach EUR20,184.7 per year, while the estimate for the annual labor salaries amounts to EUR9658.0. The imputed rent was, in this case, estimated at EUR1241.2.

Table 6. Economic Characteristics of Agricultural and Tourism Activities.

Characteristics	Average	St. Dev.	Min	Max
Agriculture				
Variable costs (EUR)	8453.6	10,885.8	30.0	50,000.0
Paid labor (EUR)	2712.1	4472.1	0.0	19,680.0
Imputed rent (EUR)	2362.8	3437.1	75.0	22,800.0
Agricultural income (EUR)	31,382.1	36,201.7	0.0	180,720.0
Tourism				
Operating costs (EUR)	20,184.7	15,794.4	4.836.0	97,400.0
Paid labor (EUR)	9658.3	32,105.9	0.0	224,400.0
Imputed rent (EUR)	1241.2	3369.3	23.0	18,900.0
Tourism income (EUR)	82,742.4	114,515.4	900.,0	672,000.0
Total income (EUR)	**114,124.5**	**118,528.0**	**12,300.0**	**711,600.0**

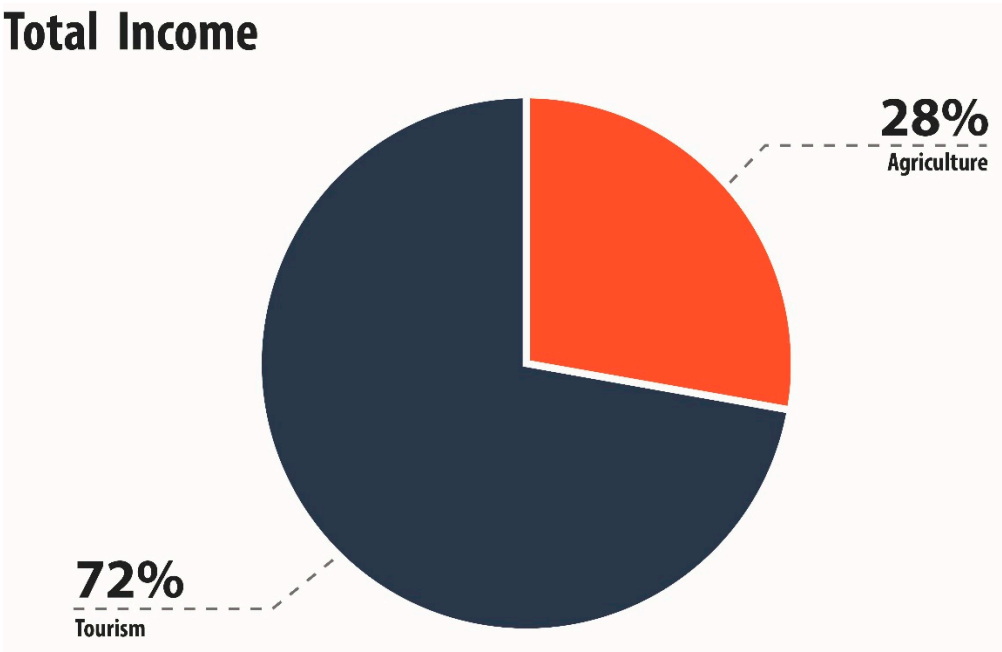

Figure 3. Share in total income (in percentages).

4.3. Bootstrap Regression Results

Table 7 presents the results of the bootstrap regression analysis accompanied by the weighting coefficients of each independent variable, meaning how much the dependent variable (Total Income) is affected. The independent variables are statistically significant for the multiple linear regression model created since they have a *p*-value less than 0.05. The imputed rent of farms is an exception because it is not statistically significant ($p = 0.51$). Regarding the tourism activities of the farms, it is clear that paid labor has a more positive effect on total earnings ($\beta = 5.83$), followed by the variable costs (total costs) ($\beta = 2.97$) with a *p*-value less than 0.05 in both cases ($p = 0.00$). Regarding tourism activity, it appears that all the factors of production (land, labor, capital) affect the total gains positively.

Table 7. Bootstrap Regression Results.

Variables	ESTIMATE	*p*-Value
Variable costs (Agriculture)	2.97	0.00 **
Paid labor (Agriculture)	5.83	0.00 **
Imputed rent (Agriculture)	−2.99	0.51
Operating Costs (Tourism)	0.89	0.02 *
Paid Labor (Tourism)	2.56	2.11×10^{-14} ***
Imputed rent (Tourism)	5.86	0.01 *

*, **, ***: Significance level.

5. Discussion

In the present analysis, the effect on farm income was examined by adopting diversified strategies in using land and, more specifically, allocating it to infrastructures for adopting additional activities such as tourism. Initially, the analysis focused on the division of incomes derived from agriculture and tourism and the division of the resources used for each of the two forms of activity. This analysis has been conducted similarly by other researchers [26]. That strengthens the argument that tourism is a factor that significantly boosts farm income.

Participation of tourism activity in profit seems to be crucial, something in agreement with previous empirical studies, confirming that including tourism activity in farms enhances their earnings [14,22,25,29,32]. The high standard deviation observed in the set of dependent and independent variables proves the heterogeneity of the farms. This result, following the findings of previous studies [14,27,29], generally attests to the uniqueness of the characteristics of small family rural areas businesses.

The analysis regarding the effect of each factor of production on the total farm income indicated that the land used by the tourism facilities has a positive impact on it.

Additionally, the analysis showed that the total income is affected by both paid labor and operating costs. Small rural family businesses are known to support their operation by employing family members, who are usually unpaid for their labor [23,34,53,54]. Moreover, these members do not necessarily possess the appropriate skills and abilities nor the tourism education to exercise this activity, as highlighted in the results of [23], given that education/training for sustainable tourism is particularly crucial [55]. The results confirm this since, in cases where farms employ paid and specialized staff, they also showcase higher earnings. Regarding the outcomes of operating costs, one could argue that increased costs are associated with costs that enhance the quality of services that, in turn, affect the final profits.

Regarding the farms, it is clear that the land used for agriculture does not significantly affect the total income of the examined farms. That statement is explained by this factor of production determining the existence of farms [4] as it gets taken for granted. On the contrary, the variable cost that concerns everything required in monetary units for the implementation of a production plan changes and gets influenced by various factors such as the choice of crops, current sell prices, and management by the owner-manager [4]. The same applies to paid labor which positively impacts the total farm income. This element essentially points out that farms that require labor hire adopt production plans of higher performance that cannot be covered by unskilled family labor, even though it usually covers most of the labor needs [5,14].

6. Conclusions

Even though many literary products have extensively studied the diversification of farms and the corresponding contribution to their income, the topic of diversification surrounding the use of land and its disposal in tourism infrastructures seems to be lacking. Considering this gap, the authors conducted a relevant investigation on 56 farms also active in tourism and located in non-coastal rural areas of Greece.

The data of the analysis were primarily collected and related to the total farm income (dependent variable) and the factors of production (land, labor, capital) of each farm (independent variables). The method used to derive the results was bootstrap regression, a choice based on the potential of this procedure in ensuring and strengthening the trustworthiness of the research sample and clarifying the most influential variables.

The analysis results indicated that the land used by the tourism facilities has a positive impact on the total income of the farms. This result answers the underlying questions raised as the topic of this research. It proves that land is not a key factor for tourism activity and gets deployed for establishing tourism infrastructure. However, tourism often utilizes non-fertile and non-cultivable lands, thus strengthening the income of farms that combine agricultural and tourism activities.

Other factors of production that benefit the total farm revenue are variable costs, paid labor, and operating costs. These factors highlight the importance of paid and family labor, the quality of services, and the various management options of owner-managers.

This paper seems to respond to previously unanswered queries, thus enhancing some previously lacking literary knowledge. Furthermore, it provides policymakers with alternative solutions to empower and promote tourism activity for farms in disadvantaged and non-coastal areas of Greece. Finally, this paper presents methods through which farm owner-managers can utilize the available factors of production–particularly that of land–to provide higher income for their families. Lastly, it is worth mentioning some of the limitations experienced during this effort, such as the investigation being confined only to Central Macedonia. Nevertheless, a popular notion dictates that one investigation's restrictions can kickstart new research. Therefore, the execution of similar analyses on other Greek Regions is encouraged so that many more helpful conclusions could be drawn.

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