

TYOLOGY OF AGRICULTURAL FINANCING INVESTMENT IN CENTRAL MACEDONIA

S. Aggelopoulos¹, V. Samathrakis¹, G. Menexes², S. Mamalis³

Abstract

The object of this paper is to analyze the improvement plans included in the project “Investments in Agricultural Holdings” of the Operational Programme “Agricultural Development and Restructuring of the Countryside 2000-2006” in order to define similar farm clusters, based on economic parameters. The paper aims to examine the extent to which the inclusion of farms in Regional Operational Programmes, through the improvement plans, will actually strengthen their viability profile. At the outset, Cluster Analysis methodology is applied and two typologies are developed of farms incorporated into the Regional Operational Programmes for Central Macedonia. The typologies are determined by economic parameters, pertaining both to the farms’ current status (first typology), and their expected status after the realization of the investments (second typology), as described in the improvement plans. This is then followed by a description of the economic profile of the farm clusters and their respective level of viability. The viability profiles of the typologies seem to confirm the significance and effectiveness of the project “Investments in Agricultural Holdings”. Providing incentives and funding for investments to farms leads to an upgrading of their economic level and a rise in both their viability and competitiveness.

Keywords: typology, agricultural investments, cluster analysis, improvement plans

¹Department of Farm Management, TEI of Thessaloniki, Greece.

²Department of Applied Informatics, University of Macedonia, Thessaloniki, Greece.

³School of Economics, Aristotle University of Thessaloniki, Greece.

Introduction

The global social, economic, technological and natural environment is undergoing rapid changes in our day and age. Such developments lead to new market conditions, new international financial agreements and a new reality in the field of agricultural economy. Agriculture in Greece is obliged to adapt to the terms of a new globalized market for agricultural products. This adaptation of agriculture to the new globalized environment essentially depends on its rate of development and the improvement of its structures, with the aim of strengthening the competitiveness of Greek products on the international market.

At present, the limited competitiveness of the agricultural sector in our country has been studied and recognized by several researchers. Various factors, such as the small size of agricultural plots, multi-fragmentation, the use of outdated means of production, high production costs, the lack of connection between production and the market, the age and educational profile of those involved in farming, etc. have resulted in a deterioration of the conditions under which Greek farms operate and trade in their products, and subsequently to a reduction of their competitive character (Galanopoulos, 2004). An indicative example is that out of approximately a total of 820,000 farms in Greece, it is estimated that less than 40% (320,000) are financially viable enterprises (Ministry of Agriculture, 2003).

A large number of agricultural investments are partly financed by national resources, and by the structural funds of the European Union. An important financing opportunity for agricultural investments was the Third Community Support Framework (CSF). Within the framework of the Operational Programme “Agricultural Development – Restructuring of the Countryside 2000-2006”, the project “Investment in Agricultural Holdings” focuses on encouraging investments on farms in order to formulate the necessary conditions that will improve their financial level, and the sustainability and competitiveness of their products. The beneficiaries of this project are natural persons or groups active in the field of primary production of agricultural or stock-breeding products, and in their initial processing and trade. The funding provided through the above-mentioned investments is based on

various regulations and directives (Tsiboukas *et al*, 1999), which call for the submission of an “Improvement Plan”, in which the type of investment is described in detail, as well as the expected improvement to the farms’ financial output. The Improvement Plans constitute the tools for converting the existing structures of Greek agriculture, into more professional, competitive enterprises (Galanopoulos *et al*, 2004).

In order for farms to be eligible for financial assistance under the framework of this subsidy scheme, they must fulfill basic preconditions related to their financial viability (Commission of the European Community, 1985 and Tsiboukas *et al*, 2000):

Various theories have evolved at times regarding the positioning of economic activities, which permit a deeper understanding of the relations and interdependencies that determine the installation of various economic activities in certain areas, with the aim of boosting their social and economic growth (Lamprianides, 1992). On this basis, changes occur in the spatial distribution of financial activities, according to the newly-formulated economic conditions and the various instruments for their implementation, such as incentives for regional development, financing policies, taxation etc. (Arabatzis *et al*, 2005; Kobrich, *et al*, 2003).

The development of typologies for rural areas in Greece has been extensively researched, particularly in relation to plant production issues. Thus, similar zones of agricultural development have been defined, i.e. spatial units-clusters with common or similar characteristics, linked to the cultivating systems applied, the available production coefficients, common problems of development etc. (Panagiotou, 1986; Karanikolas, 1999; Karanikolas and Martinos, 1999). Nevertheless, no research studies exist which lead to specific conclusions regarding the application of agricultural policies or funding, through the use of typologies.

The purpose of this paper is to perform an analysis of the improvement plans that come under the project “Investments in Agricultural Holdings” of the Operational Programme “Agricultural development and Restructuring of the Countryside 2000-2006” in order to arrive at similar farm clusters, using economic parameters as a basis. Its goal is to examine the extent to which the

inclusion of farms in Regional Operational Programmes, through plans for their improvement, will indeed strengthen their viability profile.

Materials and methods

The data used in this study was obtained from the improvement plans submitted to the Region of Central Macedonia authority. In total, during the three planning periods, during the years 2001-2002, 181 Improvement Plans were collected from the prefectures of Thessaloniki, Pella, Imathia, Kilkis, Serres and Chalkidiki. Of these, for the purposes of similarity and comparability between farms, 62 improvement plans regarding stock-breeding enterprises were exempted from the sample. Thus, the final sample consists of 119 farms involved in plant production, which develop substantial investment activities.

Using the improvement plans as a basis, we determine their basic financial results, such as family labour, gross revenue, variable costs, fixed production costs, and the percentage of subsidies (Doll and Orogen, 1984). More specifically, family labour (FL) refers to the value of family labour (hours of work X daily wage of an unskilled worker), variable costs (VC) refer to the cost of third-party seasonal work (by machine or manual), the cost of materials (seeds, fertilizers, medication, heating, etc.) and the circulating capital interest, while fixed costs (FC) refer to the annual charge of the fixed capital costs that include depreciations, foreign capital interest, net property interest, fixed capital maintenance, fuel-lubricants, rent for third-party land, multi-annual plantations, buildings, land reclamation and machinery, as well as insurance costs. Gross revenue (GR) refers to the farm's income from the sale of the quantities produced (first primary product, second primary, sub-products), and its revenue from other sources, including subsidies. The percentage of subsidies refers to the share of the total subsidies in the agricultural family income.

In order for farms to obtain financial assistance under the framework of this policy, they must be able to prove their financial viability, through the use of the following indicators mainly (Ministry of Agriculture, 2003):

- Agricultural family income (AFI) per fully-employed member of the agricultural family

- Used family labour on the farm counted in Human Labour Units (H.L.U).

Based on the above-mentioned indicators, farms are divided into the following categories (CMD 451/2001, CMD 532/2003):

a). Viable farms, that render an AFI per used family HLU higher than the reference income¹ and use (1) HLU of family labour. Based on the percentage of the subsidies in the formulation of their AFI, viable farms are split into two types:

a₁). Viable competitive, in which the share of subsidies in the formulation of the AFI is up to 20%.

a₂). Viable non-competitive, in which the share of subsidies in the formulation of the AFI is over 20%.

b). Potentially viable farms, in which the AFI per HLU, ranges between 80 and 100% of the reference income, while it is estimated that at least (1) family HLU is employed.

c). Declining farms with signs of economic recovery, in which the AFI per HLU is less than 80% of the reference income.

d). In addition, small farms can also receive financial support, as long as their owners are “new farmers” and it has been less than three years since their first crop.

Based on the above, declining farms barely manage to cover their minimum living costs, and consequently cannot secure a minimum owned capital through saving (since they do not have any extra-agricultural income), so as to participate in an investment programme that would ensure their viability. On the contrary, potentially viable farms more than cover their minimum living costs and are therefore in a position, through suitable programming, to amass the capital required as their own contribution for the realization of an investment plan that would guarantee their viability. Finally, the category of viable farms more than cover the mean living costs of households with farming as the main profession, and therefore can secure the capital required for a renewal and increase of their productive potential (Tsiboukas, 2000).

¹ The Ministry of Agricultural Development annually determines the reference income as equal to approximately 80% of the comparable income.

As mentioned above, the improvement plans are included both in the current and expected economic results, based on the investments proposed through the plans. In order to evaluate the effectiveness of the project “Investments in Agricultural Holdings”, two typologies are initially developed pertaining to farms incorporated within the Regional Operational Programmes for Central Macedonia. These typologies are determined by economic parameters, and are linked both to the farms’ current status (first typology), and their expected status (second typology) following the realization of the investments according to the improvement plans’ description. The next part of the paper presents a description of the profile of the farm clusters in relation to their economic parameters and viability level. Finally, we examine whether the farms’ expected viability profile is strengthened through the proposed investments.

Hierarchical Cluster Analysis was used to develop the typology of the agricultural investments, based on their financial output. The parameters used for the analysis were family labour, gross revenue, variable costs, fixed costs, and the percentage of subsidies. The Ward criterion was used for the formulation of the clusters and the square of Euclidean distance (Hair, *et al.*, 1995 and Sharma, 1996). The analysis was carried out with the SPSS V. 11.5.

The following categories are examined in relation to the viability profile of the farms:

1. small farm,
2. declining with signs of economic growth,
3. potentially viable,
4. viable non-competitive,
5. viable competitive.

The classification of farms according to various levels of viability, both in their current and expected status, was carried out in accordance to the data included in the relevant improvement plans.

Results and discussion

The farm's Typology as regards their Current Economic Status. The Cluster Analysis highlighted three groups – farm clusters.

The first cluster S_1 includes 71 farms (59.7%), the second cluster S_2 includes 35 farms (29.4%), and the third cluster S_3 includes 13 farms (10.9%).

The profile of the clusters pertaining to the farm's current status, based on the predefined parameters, is presented in Table 1.

Based on the determination coefficient R^2 (Table 1), the relative significance of the variables used for the cluster formation is in descending order: fixed costs, gross revenue, percentage of subsidies, variable costs and family labour. Therefore, in order of significance, a major role in cluster formation is played by the permanent capital, the farms' productivity and subsidies, expendable capital and the value of family labour.

The grouping of the three clusters is carried out based on the low, medium and high values of the economic parameters, used for their formation. As regards subsidies, the first cluster of farms is characterized by the lowest percentage, while the second cluster by the highest.

Table 1. Characteristics of the clusters showing the current status of the farms in the sample

Farm Clusters-Groups	Economic Parameters				
	Family labour	Gross income	Variable costs	Fixed costs	Percentage of subsidies
S₁					
Mean	3089.85	39781.35	20115.25	9532.66	19.35
Sample size	71	71	71	71	71
Standard deviation	1913	26204.24	14217.87	5295.80	19.96
S₂					
Mean	5819.52	65071.24	22739.01	18256.97	67.99
Sample size	35	35	35	35	35
Standard deviation	2656.15	28113.64	13296.60	9827.07	36.51
S₃					
Mean	7875	172209.54	64112.32	45573.07	36.85
Sample size	13	13	13	13	13
Standard deviation	1995.30	62894.35	31853.85	16981.89	25.09
TOTAL					
Mean	4415.44	61686.50	25693.35	16035.82	35.57
Sample size	119	119	119	119	119
Standard deviation	2751.38	51722.56	21400.23	140.29.14	33.98
R ²	0.391	0.612	0.402	0.625	0.407

Table 2 describes the viability profile of the three groups. The first cluster consists of potentially viable farms (42.3%), declining farms with signs of economic growth (31%), and the total number of small farms (18.3%). This cluster mainly includes farms which due to size (small farms) or mismanagement, barely cover their minimum living costs and therefore cannot afford the minimum owned capital required for their participation in investment programmes that could potentially render them viable.

The second cluster consists of declining farms with signs of economic growth (40%), potentially viable farms (42.9%), viable non-competitive farms

(8.6%) and competitive farms (5.7%). It also includes some small farms (2.9%). This cluster mainly involves farms with can participate in investment programmes either marginally, through proper programming, or with great facility.

The third cluster consists of potentially viable farms (53.8%), viable non-competitive farms (38.5%) and viable competitive farms (7.7%). This cluster includes farms which are in a position to raise the necessary capital for the realization of an investment plan, either by more than covering the mean living costs of the agricultural households, or through suitable programming.

Table 2. Farm clusters in relation to their viability profile.

		Small farm (1)	Declining with signs of economic growth (2)	Potentially viable (3)	Viable non-competitive (4)	Viable competitive (5)	Total
1 st cluster	Number of farms	13	22	30	3	3	71
	Percentage of the row's total	18.3	31	42.3	4.2	4.2	100
	Adj. Residual	2.7	0.2	-0.4	-2.3	-0.5	
2 nd cluster	Number of farms	1	14	15	3	2	35
	Percentage of the row's total	2.9	40	42.9	8.6	5.7	100
	Adj. Residual	-1.9	1.5	-0.1	-0.2	0.2	
3 rd cluster	Number of farms	0	0	7	5	1	13
	Percentage of the row's total	0	0	53.8	38.5	7.7	100
	Adj. Residual	-1.4	-2.5	0.8	3.9	0.5	
Total	Number of farms	14	36	52	11	6	119
	Percentage of the row's total	11.8	30.3	43.7	9.2	5	100

The viability profile of the farms in the clusters is presented in Diagram

1.

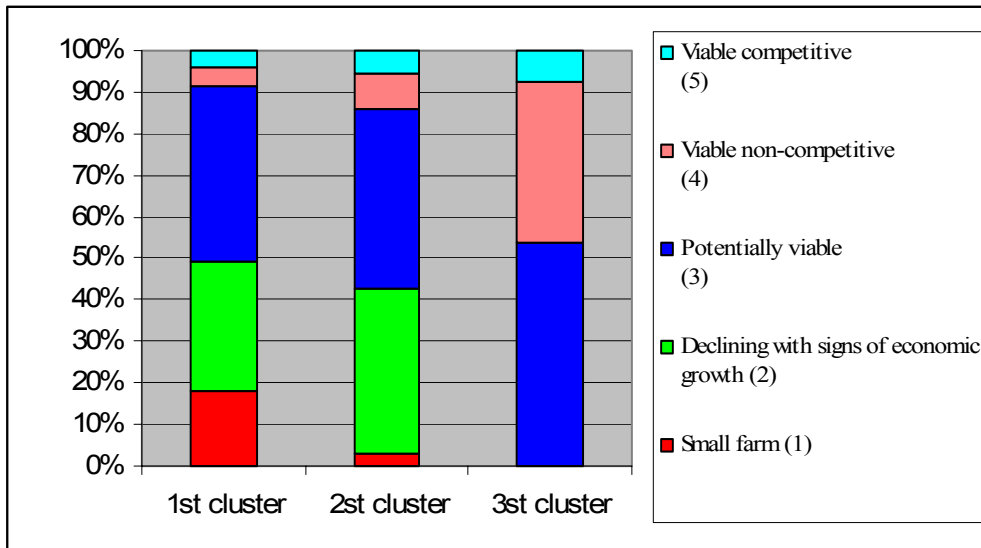


Diagram 1. Cluster formation based on the viability profile

Axon Y: share of the viability profile,

Axon X: farm clusters

A “Hierarchical Cluster Analysis” was carried out based on the economic parameters arising from the realization of the investment activities, as described in the improvement plans. The analysis showed 2 farm clusters.

The first cluster consists of 101 farms (84.9%), and the second cluster includes 18 farms (15.1%). The profile of the clusters of the first level, based on the predetermined parameters, is shown in Table 3.

Table 3. Characteristics of the farm clusters in the sample

Farm Clusters-Groups	Family labour	Gross income	Variable costs	Fixed costs	Percentage of subsidies
S₁					
Mean value	4206.72	93742.93	31284.87	38091.33	29.19
Sample size	101	101	101	101	101
Standard deviation	2391.53	40044.37	21353.17	14696.56	29.33
S₂					
Mean value	8448.61	278260.41	88834.26	80702.65	26.34
Sample size	18	18	18	18	18
Standard deviation	1515.90	191402.41	54025.54	25995.62	22.86
TOTAL					
Mean value	4848.35	121653.14	39989.82	44536.74	28.76
Sample size	119	119	119	119	119
Standard deviation	2740.01	105094.39	35152.46	22704.14	28.38
R^2	0.310	0.399	0.347	0.456	0.001

Based on the determination coefficient R^2 (Table 3), the relative significance of the variables, used for the cluster formation in descending order is the following: fixed costs, gross revenue, variable costs, family labour and percentage of subsidies. We observe that, in the new cluster formation, the role of subsidies is not significant, since their usefulness has already been exhausted.

The grouping of the two clusters is performed based on the lowest and highest values of the economic parameters, used for their determination. As far as the subsidies are concerned, the first cluster is linked to the highest percentage, and the second cluster to the lowest.

Table 4 describes the viability profile of the two groups.

Table 4. Farm clusters in relation to their viability profile following the application of the investment programme.

		Small farm (1)	Declining with signs of economic growth (2)	Potentially viable (3)	Viable non-competitive (4)	Viable competitive (5)	Total
1 st cluster	No of farms	0	1	16	51	33	101
	Percentage of the row's total	0	1	15.8	50.5	32.7	100
	Adj. Residual	0.2	0.4	1.8	-0.8	-0.5	
2 nd cluster	No of farms	0	0	0	11	7	18
	Percentage of the row's total	0	0	0	61.1	38.9	100
	Adj. Residual	0.2	-0.4	-1.8	0.8	0.5	
Total	No of farms	0	1	16	62	40	119
	Percentage of the row's total	0	0.8	13.4	52.1	33.6	100

The first cluster mainly consists of viable non-competitive farms (50.5%), viable competitive farms (32.7%), and potentially viable farms (15.8%).

The second cluster mainly consists of viable non-competitive farms (61.1) and viable competitive farms (38.8%).

As we can see from the analysis of the clusters that emerged after the application of the investment programmes, all farms are now characterized by an improved financial level and viability standard. Furthermore, small farms have been eradicated, along with the declining farms with signs of economic growth. This event goes to prove the success of the project “Investments in Agricultural Holdings” of the Operational Programme “Agricultural Development and Restructuring of the Countryside 2000-2006”, which aims to encourage investments on farms for the purpose of creating the conditions required to improve their viability and competitiveness.

The grouping of the new clusters based on their viability profile is shown in Diagram 2.

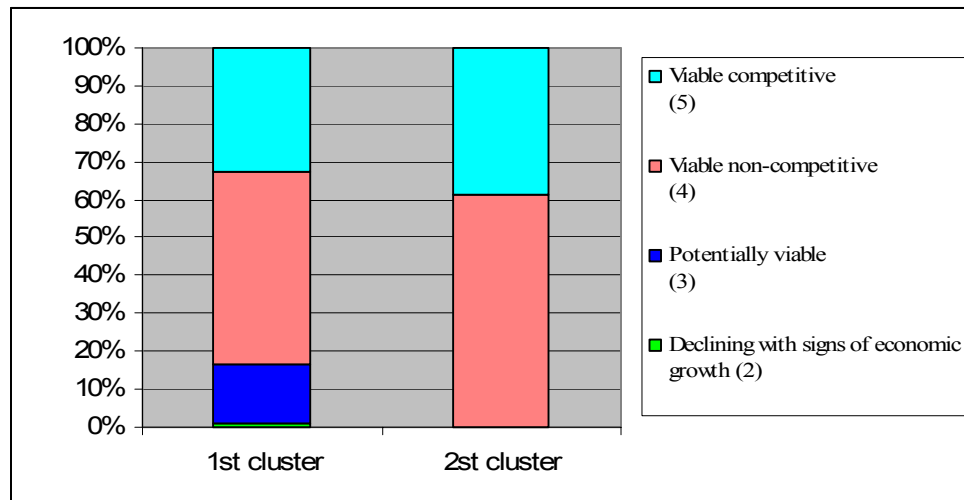


Diagram 2. Cluster formation based on the viability profile
 Axon Y: share of the viability profile, Axon X: farm clusters

Conclusions

The aim of this paper was to examine whether the inclusion of farms in the Improvement Plans will strengthen their viability profile. In relation to their current economic status, the farms are divided into three groups which are accordingly characterized by the low, medium and high values of their economic parameters. The first cluster is characterized by the lowest percentage of subsidies, while the second cluster by the highest percentage. The relative significance of the economic parameters used for the cluster formation, in order of significance, is: fixed costs, gross revenue, percentage of subsidies, variable costs and family labour. The first cluster mainly consists of farms which barely cover their minimum living expenses, either due to size or mismanagement, and therefore cannot afford the minimum owned capital required for participation in investment programmes aimed to improve their viability.

The second cluster mainly consists of farms which are in a position to take part in investment programmes either marginally, through proper programming, or with great facility.

The third cluster consists of farms which either more than cover the mean living expenses of the agricultural households or are capable, through

proper programming, of securing the capital needed for the implementation of an investment plan.

Based on the economic parameters expected to arise from the investment activities described in the relevant improvement plans, we arrive at the formation of two farm clusters. The two clusters are formulated based on the low and high values of the economic parameters used for their determination. Regarding subsidies, the first cluster is characterized by the highest percentage, while the second cluster by the lowest. The relative significance of the variables used for the cluster formation, in descending order, is: fixed costs, gross revenue, variable costs, family labour and percentage of subsidies. As it has been previously mentioned, the economic factors describing the viability profile of the second typology reflect the farms' anticipated economic status which is expected to come from the implementation of investment activities of the improvement plans.

The first cluster consists of viable non-competitive, viable competitive and potentially viable farms.

The second cluster mainly consists of viable non-competitive and viable competitive farms.

If we compare the viability profile of the clusters of farms incorporated in the project "Investments in Agricultural Holdings" of the Operational Programme "Agricultural Development and Restructuring of the Countryside 2000-2006", we observe that the preconditions are indeed formulated for an improvement of the farms' economic level, that will lead to increased competitiveness. These farms, through the planned investments, are thus rendered financially viable.

Furthermore, it would be interesting to evaluate the farms following the implementation of their investments activities, so as to determine the validity of the project.

References

- Arabatzis G., Batzios Ch., Samathrakis V., Koutroumanidis Th., (2005). "Typology of Stock-breeding Activities in the Prefecture of Thessaloniki". *Geotechnical Scientific Issues*, series VI, volume 16, issue 2, (In Greek).
- Galanopoulos K., Kamenidou E., Tziakas V., Mitsopoulos A., (2004). "Technological progress in agricultural production: Analysis of Improvement Plans in Central Macedonia", 7th ETAGRO Conference, (In Greek).
- Coakes, S., and Steed, L., (1999). "SPSS Analysis without Anguish", *Singapore: John Willey and Sons, Inc.*
- (Commission of the European Community, (1985). "A future for Community agriculture: Commission guidelines following consultations in connection with the Green Paper", COM(85)750.
- Doll, J. and Oragen, F., (1984). "Production Economic", John Wiley and Sons, New York.
- Hair, J., Anderson, R., Tatham, R. and Black, W., (1995). "Multiariate Data Analysis With Readings", 4th Edition, Prentice-Hall International, INC., USA.
- Hinkle, D., Wiersma, W., and Jurs, S., (1988). "Applied Statistics for the Behavioral Sciences", 2nd Edition, Boston: Houghton Mifflin Company.
- Karanikolas, P., (1999). "Homogeneity and Heterogeneity in Agricultural Space". *Critical Approaches in the Development and Environmental Protection of the Countryside*. Edited by L. Louloudis and N. Beopoulos. Stochastis Publications, Agricultural University of Athens, pp.59-75, (In Greek).
- Karanikolas, P., and Martinos, N., (1999). "Spatial Differentiation of Greek Farming towards 2010". *Papazisis Publications*, Agricultural University of Athens, pp.245-307, (In Greek).
- Kinnear, T. and Taylor, J.,(1996). "Marketing Research An Applied Approach", 5th Edition, *McGraw-Hill, INC.*, USA.
- Kobrich, C., Rehman, T. and Khan, M. (2003). "Typification of Farming Systems for Constructing Representative Farm Models: Two Illustrations of the Application of application of multi-variable analysis in Chile and Pakistan", *Agricultural Systems*, 76(1), 141-157.
- Kolyva-Machaira, F. and Bora-Senta, E., (1998). "Statistics: Theory and Applications", Zitis Publications, Thessaloniki.

- Lamprianides, L., (1992). "Elements of Economic Geography, Paratiritis Publications, Thessaloniki.
- Mehta, C. and Patel, N., (1996). "SPSS Exact Tests 7.0.for Windows" SPSS Inc.
- Panagiotou, A., (1986). "Productive structures and Production Systems: A Methodological Approach in the Creation of Agricultural Development Units. Minutes of A.B.G. International Conference: Economy and the Agricultural Sector, Vol. A: 326-339, (In Greek).
- Sharma, S., (1996). "Applied Multivariate Techniques". New York: John Willey and Sons, Inc.
- Siardos, G., (1999). "Multivariate Statistical Analysis Methods", Part A', Zitis Publications, Thessaloniki, (In Greek).
- Tsiboukas, K., Tsoukalas S., Karanikolas V., Nellas, E., (2000), "The financial viability of farms in Greece under the framework of the agricultural structural policy", (In Greek).
- Tsiboukas, K. and Tsoukalas, S., (1999). "Structure and typology of farms towards 2010", in the collective volume: Maravegias N. (ed): "Greek farming towards 2010", Papazisis Publications, Athens, (In Greek).
- Tsantas, N., Moysiades, Ch., Bagiatis, N., and Chatzipantelis, Th., (1999). "Data Analysis with the help of Statistical Packages", Thessaloniki: Zitis Publications, (In Greek).
- Ministry of Agriculture (2003). Sustainable Agriculture in a Developed Countryside. The vision of a decade for Greek farming and the countryside. Athens, (In Greek).