American Journal of Applied Sciences 11 (9): 1486-1491, 2014
ISSN: 1546-9239

doi:10.3844/ajassp.2014.1486.1491 Published Online 11 (9) 2014 (http://www.thescipub.com/ajas.toc)

ECONOMIC ANALYSIS OF PROCESS INNOVATIONS IN THE MANAGEMENT OF OLIVE FARMS

Riccardo Testa, Anna Maria Di Trapani, Filippo Sgroi and Salvatore Tudisca

Department of Agricultural and Forestry Sciences, University of Palermo, Italy

Received 2014-05-16; Revised 2014-06-25; Accepted 2014-07-04

ABSTRACT

Within a business enterprise, process innovations lead to reduced production costs and to increased profit margins. In this study, we shall examine an olive farm that operates in a perfectly competitive market that has introduced a process innovation so as to contain labour costs and therefore production costs. So, the paper aimed at comparing economic competitiveness of an olive farm that introduced mechanical olive pickers (process innovation) for harvest respect to manual harvest. In the case under scrutiny, for the same price, the reduced production cost determined a shift from a situation of being at a loss to one of profit for the business. Economic analysis showed that introduction of mechanical olive pickers can determine a competitive advantage in small and medium-sized olive farms of Mediterranean areas which decide to mechanize the harvest.

Keywords: Competitiveness, Costs, Farms, Profitability

1. INTRODUCTION

The olive tree, together with citrus, wine grape and durum wheat, is a typically Mediterranean plant that boasts a long tradition in Italy and that has had considerable socio-economic importance attached to its cultivation especially in the southern regions (Sicily, Calabria and Apulia) due to favourable pedological and climatic characteristics (Laidò *et al*., 2013; Martinelli *et al*., 2013; Tudisca *et al*., 2013a; Salomone and Ioppolo, 2012; Taranto *et al*., 2012). In Sicily, olive-tree cultivation is favoured by the Mediterranean climate (Grillone *et al*., 2014; 2012; 2009; Rodríguez-Entrena *et al*., 2012; D'Asaro *et al*., 2014; D'Asaro and Grillone, 2012; Agnese *et al*., 2008). Above and beyond a purely economic facet, olive-growing portrays an irreplaceable role in environmental protection, while safeguarding the agricultural ecosystem as well as preserving the landscape (Mohamad *et al*., 2013; Avraamides and Fatta, 2008; FranciaMartínez *et al*., 2006).

From an economic perspective, olive cultivation generates income for many agricultural firms in Sicily as well as providing employment in terms of total labour hours involved in performing farming tasks (De Gennaro *et al*., 2005). However, strong pressure from competitor countries (e.g., Spain) combined with the current period of economic recession are resulting in a crisis for many farms in southern Italy (Sgroi *et al*., 2014a; Tudisca *et al*., 2013b; Santeramo *et al*., 2012, Castro *et al*., 2008). In many farms, cultivation practices for olive trees are characterized by facilities that are more than a century old and that are difficult to modify structurally (Vossen, 2007). This situation involves the increase of entrepreneurial risks and, subsequently, it is necessary adopting strategies in order to reduce them (Lupo, 2013a; Certa *et al*., 2012).

In this economic scenario, given that investments in the olive-growing sector represent a long-term commitment, in order to be competitive, the entrepreneur can only draw on variable inputs, putting them gainfully into play (Messori, 2007). Among these variable inputs, the entrepreneur may vary labour, among the factors of production, for example with the introduction of harvesting machinery which

Corresponding Author: Riccardo Testa, Department of Agricultural and Forestry Sciences, University of Palermo, Italy

increases the productivity of the labour factor (Houssou *et al*., 2013; Fardella *et al*., 2008). By so doing, sales price of the output remaining unvaried, there is an improvement of the profit margin. This choice becomes crucial for an entrepreneur who operates within a competitive market and whose business, having no market power, is forced to accept prices (Tudisca *et al*., 2014a; Sgroi *et al*., 2014b). In this study, we have analyzed how an entrepreneur in the short-term can regain competitiveness through technological progress that leads to an improved profit margin. Technical progress determines a lowering of the cost curves and guarantees that a firm may operate with greater production capacity. This corresponds to a dynamic economic model in which entrepreneur can take advantage of technological innovations, access to new markets and change organizational modalities of production according to consumer preferences (D'Amico *et al*., 2003). In this way, entrepreneur could obtain an increase of farm competitiveness and positive effects on the territory (Lanfranchi and Giannetto, 2013).

2. MATERIALS AND METHODS

The analysis was conducted on an olive-growing farm in Sicily producing oil olives of the Cerasuola cultivar. The firm only covers the first production stage; it sells bulk olive oil and does not engage in other steps of the production process. This type of farming enterprise is widespread in Sicily (Tudisca *et al*., 2014b). The surface area of its facilities is equal to 5.50 ha, only 3.30 ha of which is for actual olive growing. The age of the plants amounts to 20 years, whose production in kilos of olives equals 40 quintals/ha with an olive oil yield of 18%. The remaining surface area is under vine.

The type of enterprise taken as the object of our study operates in a competitive market, produces goods that are homogeneous and has zero market power. The number of competitors present on the market is so elevated that each one of them is forced to accept market prices. Producers are aware that they can sell at the prevailing market price and that they have no bargaining power whatsoever. In such a market, firms recognize that, in order to increase profits, their only levers are those capable of adjusting production costs downwards.

Our study focused on answering the following question: In a situation where average costs, at the starting point, are greater than marginal revenues, how can an enterprise achieve positive profit margins, also given the modest size of most firms, which tend to discourage, from an economic point of view, their engagement in the entire production process? Data was collected through direct interview of the entrepreneur (Tudisca *et al*., 2011). All economic evaluations refer to the year 2013.

The strategy to improve profit margins can be pursued by analyzing the various steps that lead to obtaining the output. In this first phase, we analyze the breakdown of the costs incurred by the firm for every single operation. For each operation, we estimate the share of costs that it absorbs (Collins and Montgomery, 1997). This stage allows to highlight those activities which are crucial, in terms of costs and that consequently have greater significance for the strategy applied. A profit margin improvement is a condition that must be assessed in relative terms: It depends on the level of a firm's costs compared to those of its competitors, or rather to the average costs incurred by the strategic rival grouping of reference.

The second step consists, in fact, in comparing the costs incurred by the firm, while undertaking the various activities, with those its competitors face in the corresponding operations (Pontiggia, 2001; Perrone, 1990). This phase depends on the actual availability of data pertaining to the cost structure of the firms with which the entrepreneur is making the comparison; in most cases, considering the level of technology, this information is easily obtainable also thanks to the experience that the entrepreneur has of the sector. The comparison with competitors remains an essential stage of the procedure as it highlights two basic conditions for the subsequent elaboration of the strategy.

In the third phase, the logical sequence proceeds between the process phase delineating the general situation proving to be "critical" in terms of cost and the phase relative to the elaboration of a strategy. In this third phase, the determinants of level of costs are studied.

On the basis of observations of the various determinants of costs, we proceed to define the strategy to achieve the position of advantage over competitors. This strategy can go in either of two different directions: On the one hand, it can be oriented to detect interventions on cost determinants aimed at achieving the best result in the various activities; alternatively, it can innovate the organization of these activities in

relation to the olive growers and opportunities inherent in the features of the various cost determinants.

The last phase identifies the actions to be taken in order to implement the strategy defined in the previous phase and the new procedures that can be used for that purpose. In this phase, with reference to the operations of production process, the entrepreneur can implement measures capable of reducing production costs (Roy and Vézina, 2001; Sharp and Dawes, 2001). In contrast to his/her competitors, our entrepreneur may for example take action regarding harvesting costs. In particular, results from other studies (Donia *et al*., 2009) have demonstrated that harvesting machinery, such as mechanical olive pickers (process innovations), may be conveniently introduced, even for olive farms of small surface areas. In this case, we are dealing with innovations that relate to the organizational structure of the business. It consists in new machinery that represents a long-term investment of considerable utility when introduced into small olive farms often with trees up to centuries old (Fardella *et al*., 2010). Since the aim of this analysis concerns whether this process innovation in olive growing determines an economic advantage, we have considered only the olive-growing facet of the enterprise, ascribing joint costs to the wine-growing segment as reported in the literature (Prestamburgo and Saccomandi, 1995).

3. RESULTS

The results obtained show that the total cost of production amounts to €480.44/q, of which €395.77/q represent costs for cultivation tasks, while the calculated costs are €84.67 (**Table 1**). With reference to the cultivation tasks, the major item in terms of costs is that related to harvesting (€189.58/q) and those related to pruning (€61.98/q), that together represent 52.4% of the total cost of production. The milling phase accounts for 9.3% of the total production cost, followed by treatments (4.9%), ploughing (4.3%) and irrigation (4.2%). Under the heading of calculated costs, the item capital asset depreciation (7.2% of the total) is significant, due to the high initial outlay required, followed by administration costs (3.3%), taxes (2.5%) and interests (1.4%).

In the hypothesis of introducing the process innovation, the total cost of production is lowered from €480.44/q to €387.95/q (-19.3%). Furthermore, when compared to the average of its competitors the cost is lowered by 21.9%.

Table 1. Economic results

	Situation ex ante case study			Competitor			Situation post ante case study		
Cost of items	€/ha	€/q	%	€/ha	€/q	%	€/ha	€/q	%
Ploughing soil	150,00	20,83	4,3	164,50	24,05	4,8	150,00	20,83	5,4
Pruning	446,23	61,98	12,9	385,00	56,29	11,3	446,23	61,98	16,0
Elimination post-pruning debris	72,78	10,11	2,1	95,00	13,89	2,8	72,78	10,11	2,6
Elimination root suckers	48,52	6,74	1,4	72,00	10,53	2,1	48,52	6,74	1,7
Fertilizer	132,00	18,33	3,8	150,00	21,93	4,4	132,00	18,33	4,7
Treatments	170,00	23,61	4,9	202,00	29,53	5,9	170,00	23,61	6,1
Irrigation	145,00	20,14	4,2	150,00	21,93	4,4	145,00	20,14	5,2
Harvesting	1.365,00	189,58	39,5	1.260,00	184,21	37,1	710,00	98,61	25,4
Milling	320,00	44,44	9,3	304,00	44,44	8,9	320,00	44,44	11,5
A) Total costs cultivation tasks	2.849,53	395,77	82,4	2.782,50	406,80	81,9	2.194,53	304,80	78,6
Administrative and general expenses	115,20	16,00	3,3	109,44	16,00	3,2	115,20	16,00	4,1
Taxes	88,00	12,22	2,5	101,00	14,77	3,0	88,00	12,22	3,2
Interest	48,96	6,80	1,4	48,06	7,03	1,4	38,04	5,28	1,4
Depreciation quota	250,00	34,72	7,2	250,00	36,55	7,4	250,00	34,72	9,0
Interest on capital assets (land)	107,50	14,93	3,1	107,50	15,72	3,2	107,50	14,93	3,8
B) Total calculated costs	609,66	84,67	17,6	616,00	90,06	18,1	598,74	83,16	21,4
C) Total Cost (A+B)	3.459,19	480,44	100,0	3.398,50	496,86	100,0	2.793,27	387,95	100,0
D) Gross production value	2.880,00	400,00		2.736,00	400,00		2.880,00	400,00	
Olives (q)	40,00			38,00			40,00		
Oil (q)	7,20			6,84			7,20		
E) Profit (D-C)	-579,19	-5,79		-662,50	-6,62		86,73	0,87	

Source: Our processing of directly collected data

4. DISCUSSION

Results show that harvest and pruning represent the main cost items, becoming crucial to obtain the output (Kunihiro, 2013; Sarig, 2012; Tombesi *et al*., 2014).

The comparison of the cost structure of the olive-growing farm under consideration, to those of its competitors, basically shows a situation that is very similar. This situation derives from the choices of the competing farms, in function of their management techniques regarding their olive groves and of the variety examined (Tudisca *et al*., 2013c). The minor differences that can be noticed are due to the construction of the average data that reflects the different business situations in the area under investigation.

Process innovation improves technical and economical farm efficiency. In fact, in addition to decrease production costs, it determines a better quality of harvested olives respect to manual technique (Zipori *et al*., 2014). Moreover, process innovation allows to repair to the lack of harvesting labour force (Lupo, 2013b; Tous, 2011), especially in developed country where there are several phenomena of rural exodus (Sgroi *et al*., 2014c; Tudisca *et al*., 2014c). The new situation (i.e. after imparting a process innovation) represents a clear economic advantage for the olive farm herein examined, with respect to its competitors. So, process innovations, in addition to increase farm profitability, play a key role for territorial development (Tudisca *et al*., 2014d; Safdari *et al*., 2010). In fact, innovative farm is able to originate job opportunities for the people of territory in which farm is localized.

5. CONCLUSION

The olive tree is a typically Mediterranean plant, in fact, its cultivation is more concentrated in countries of the Mediterranean basin (Spain, Italy and Greece). From the economic point of view, entrepreneurs choose those options, amongst the ones possible, that allow them to achieve the highest profit. In this study we have analyzed the economic results within an olive-growing farm where the entrepreneur introduces practices that boost labour productivity.

The empirical analysis developed on our case study highlights how a process innovation leads to a reduction in the average costs of production such that, marginal revenue (€/q) remaining equal, the business situation alters from loss to profit. Economic analysis, in fact, showed that introduction of mechanical olive pickers can determine a competitive advantage in small and medium-sized olive farms of Mediterranean areas which decide to mechanize the harvest. Technical progress thus leads firms to achieve a competitive advantage that can be maintained as long as competitors do not imitate that strategy. In the long period, competitors are most probably going to imitate the strategy adopted by the firm that innovated first. In fact, entrepreneurs who innovate first do achieve a cost advantage. In time, other firms will replicate the very strategy adopted by the innovating firm and adapt their organizations so as to achieve a cost advantage, too. If the price of goods does not fall, firms will keep their cost advantage intact. Most likely, in the long period the price of the goods will tend to decrease, until a certain point when the advantage is rendered null, as the number of firms imitating the strategy in that sector increases. In this case, emerging strategies are those that determine a firm's ultimate success. The innovating enterprise must continuously innovate and invest in research strategies to be competitive, as the propagation of innovation determines a return to the original situation, with average costs greater than marginal revenue and negative profit margins.

6. ACKNOWLEDGEMENT

This study is a result of the full collaboration of all the authors. However, F. Sgroi elaborated paragraph 2, A.M. Di Trapani wrote paragraph 1, R. Testa wrote paragraphs 3 and 4, while S. Tudisca elaborated paragraph 5.

7. REFERENCES

Agnese, C., F. D'Asaro, G. Grillone and A. Drago, 2008. Comparison of temperature data collected in urban and agricultural areas surrounding. Italian J. Agrometeool, 13: 48-49.

Avraamides, M. and D. Fatta, 2008. Resource consumption and emissions from olive oil production: A life cycle inventory case study in Cyprus. J. Cleaner Product., 16: 809-821. DOI: 10.1016/j.jclepro.2007.04.002

Castro, J., E. Fernández-Ondoño, C. Rodríguez, A.M. Lallena and M. Sierra *et al*., 2008. Effects of different olive-grove management systems on the organic carbon and nitrogen content of the soil in Jaén (Spain). Soil Tillage Res., 98: 56-67. DOI: 10.1016/j.still.2007.10.002

Certa, A., M. Enea, G. Galante and T. Lupo, 2012. A multi-objective approach to optimize a periodic maintenance policy. Proceedings of the 18th ISSAT International Conference on Reliability and Quality in Design. Jul. 26-28, United States, Boston, MA.

Collins, D.J. and C.A. Montgomery, 1997. Corporate Strategy: Resources and the Scope of the Firm. 1st Edn., McGraw-Hill, New York, ISBN-10: 0256178941, pp: 764.

D'Amico, M., G. La Via andB. Pecorino, 2003. The sensitivity of the consumers on the quality of fresh organic greenhouse tomato in Italy. Acta Horticulturae, 608: 117-123

D'Asaro, F., G. Grillone and R. H. Hawkins, 2014. Curve number: empirical evaluation and comparison with curve number handbook tables in Sicily. J. Hydrol. Eng. DOI: 10.1061/(ASCE)HE.1943-5584.0000997

D'Asaro, F. and G. Grillone, 2012. Empirical investigation of curve number method parameters in the Mediterranean area. J. Hydrol. Eng., 17: 1141-1152. DOI: 10.1061/(ASCE)HE.1943-5584.0000570.

De Gennaro, B., B. Notarnicola and G. Tassielli, 2005. Ricadute ambientali nella filiera dell'olio di oliva. Estimo e Territorio, 48: 11-19.

Donia, E., F. Sgroi and S. Tudisca, 2009. Economic aspects of olive-growing an oil production in the Nebrodis rural areas. Proceedings of teh 3rd IRT International Scientific Conference "Integrated Relational Tourism Territories and Development in the Mediterranean Area., Oct. 24-26, Helwan-Egypt.

FranciaMartínez, J.R., V.H. DuránZuazo and M. Raya, A, 2006. Environmental impact from mountainous olive orchards under different soil-management systems (SE Spain). Sci. Total Environ., 358: 46-60. DOI: 10.1016/j.scitotenv.2005.05.036

Fardella, G.G., P. Columba, L. Altamore, F. Sgroi and G. Corona, 2010. Aspetti Economici ed Organizzativi Delle Imprese Olivicole ed Olearie in Sicilia. In: Atti del Convegno internazionale e Finale del Progetto RIOM, Rende 11-12/06/2009, F.lli Guido Arti Grafiche Edizioni, Rende (CS), ISBN 978-88-902732-4-7.

Fardella, G.G., L. Altamore, F. Sgroi and V. Fazio, 2008. Le Imprese Olivicole ed olearie in Sicilia: Valutazione Degli Aspetti Economici ed Organizzativi. In: Atti del Convegno Internazionale: "Ricerca ed Innovazione per la Filiera Olivicolo-Olearia dei Paesi del Mediterraneo", Bari 20/10/2007, F.lli Guido Arti Grafiche Edizioni, Rende, ISBN: 978-88-902732-5-4.

Grillone, G., G. Baiamonte and F. D'Asaro, 2014. Empirical determination of the average annual runoff coefficient in the mediterranean area. Am. J. Applied Sci., 11: 89-95. DOI: 10.3844/ajassp.2014.89.95

Grillone, G., C. Agnese and F. D'Asaro, 2012. Estimation of daily solar radiation from measured air temperature extremes in the mid-mediterranean area. J. Irrigat. Drainage Eng., 138: 939-947. DOI: 10.1061/(ASCE)IR.1943-4774.0000480

Grillone, G., C. Agnese and F. D'Asaro, 2009. Estimation of solar radiation in Sicily by daily data maximum and minimum temperature. Italian J. Agrometeorol., 14: 84-85.

Houssou, N., X. Diao, F. Cossar, S. Kolavalli and K. Jimah *et al*., 2013. Agricultural mechanization in Ghana: Is specialized agricultural mechanizationservice provision a viable business model. Am. J. Agric. Econ., 95: 1237-1244. DOI: 10.1093/ajae/aat026

Kunihiro, T., 2013. Agricultural mechanization in sub Saharan Africa for a better tomorrow. AMA, Agricultural Mechanization in Asia, Africa and Latina America.

Lanfranchi, M. and C. Giannetto, 2013. Analysis of the economic evaluation of an Italian farm in response to the economicfinancial crisis that the EU is going through. Quality Access Success, 14: 119-124

Laidò, G., G. Mangini, F. Taranto, A. Gadaleta and A. Blanco *et al*., 2013. Genetic diversity and population structure of tetraploid wheats (*Triticumturgidum* L.) estimated by SSR, DArT and pedigree data. PLoS ONE, 8: e67280-e67280. DOI: 10.1371/journal.pone.0067280

Lupo, T., 2013a. Handling stakeholder uncertain judgments in strategic transport service analyses. Transport Policy, 29: 54-63. DOI: 10.1016/j.tranpol.2013.04.002

Lupo, T., 2013b. A fuzzy ServQual based method for reliable measurements of education quality in Italian higher education area. Expert Syst. Applic., 40: 7096-7110. DOI: 10.1016/j.eswa.2013.06.045

Martinelli, F., B. Basile, G. Morelli, R. D'Andria and P. Tonutti, 2013. Effects of irrigation on fruit ripening behavior and metabolic changes in olive. Scientia Horticulturae, 144: 201-207. DOI 10.1016/j.scienta.2012.07.012

Messori, F., 2007. L'azienda Agraria. 1st Edn., Edizioni FAG Srl, ISBN-10: 8882336530, pp: 192.

Mohamad, R.S., M.R. Bteich, G. Cardone and A. Marchini, 2013. Economic analysis in organic olive farms: the case of theancient olive trees in the rural parkland in Apulia. New Medit, 12: 55-61.

Perrone, V., 1990. Le strutture organizzative d'impresa. Criteri e modelli di progettazione. Egea, Milano, Italy.

Pontiggia, A., 2001. L'impiego efficiente delle tecnologie di informazione. Egea, Milano, Italy.

Prestamburgo, M. and V. Saccomandi, 1995. Economia agraria. Etaslibri, Milano, Italy.

Rodríguez-Entrena, M., J. Barreiro-Hurlé and J.A. Gómez-Limón, 2012. Evaluating the demand for carbon sequestration in olive grove soils as a strategy toward mitigating climate change. J. Environ. Manage., 112: 368-76. DOI: 10.1016/j.jenvman.2012.08.004

Roy, M.J. and R. Vézina, 2001. Environmental performance as a basis for competitive strategy: opportunities and threats. Corporate Environ. Strategy, 8: 339-347. DOI: 10.1016/S1066-7938(01)00118-X

Safdari, M., M. Shahiki and Z.Sheidaee, 2010. How does human capital affect on growth in different economies? J. Soc. Sci., 6: 416-423. DOI: 10.3844/jssp.2010.416.423

Salomone, R. and G. Ioppolo, 2012. Environmental impacts of olive oil production: A Life Cycle Assessment case study in the province of Messina (Sicily). J. Cleaner Product., 28: 88-100. DOI: 10.1016/j.jclepro.2011.10.004

Santeramo, F.G., J. Di Pasquale, F. Contò, S. Tudisca and F. Sgroi, 2012. Analyzing risk management in Mediterranean Countries: The Syrian perspective. New Medit, 11: 35-40.

Sarig, Y., 2012. Mechanical harvesting of fruit-Past achievements, current status and future prospects", Acta Horticulturae, 965: 163-170.

Sharp, B. and J. Dawes, 2001. What is differentiation and how does it work? J. Market. Manage., 17: 739-759. DOI: 10.1362/026725701323366809

Sgroi, F., S. Tudisca, A.M. Di Trapani, T. Testa and S. Tudisca, 2014a. Efficacy and efficiency of Italian energy policy: The case of PV systems in greenhouse farms. Enegies, 7: 3985-4001. DOI: 10.3390/en7063985

Sgroi, F., A.M. Di Trapani, T. Testa and S. Tudisca, 2014b. The rural tourism as development opportunity of farms. The case of direct sales in Siciliy. Am. J. Agric. Biol. Sci., 9: 407-419. DOI : 10.3844/ajabssp.2014.407.419

Sgroi, F., A.M. Di Trapani, T. Testa and S. Tudisca, 2014c. Strategy to increase the farm competitiveness. Am. J. Agric. Biol. Sci., 9: 394-400. DOI 10.3844/ajabssp.2014.394.400

Taranto, F., L.N. Delvecchio, G. Mangini, L. Del Faro and A. Blanco *et al*., 2012. Molecular and physico-chemical evaluation of enzymatic browning of whole meal and dough in a collection of tetraploidwheats. J. Cereal Sci., 55: 405-414. DOI: 10.1016/j.jcs.2012.02.005

Tombesi, A., D. Farinelli, M. Pilli and M. Ruffolo, 2014. Work productivity of teams with different pruning tools in olive. Acta Horticulturae, 949: 95-600

Tous, J., 2011. Olive production systems and mechanization. Acta Horticulturae, 924: 169-184

Tudisca, S., A.M. Di Trapani, E. Donia, F. Sgroi and R. Testa, 2014a. Entrepreneurial strategies of Etna wine farms. International J. Entrepreneurship Small Bus., 21: 155-164. DOI: 10.1504/IJESB.2014.059470

Tudisca, S., A.M. Di Trapani, F. Sgroi and R. Testa, 2014b. Organic farming and economic sustainability: The case of Sicilian durum wheat. Quality Access Success, 15: 93-96

Tudisca, S., A.M. Di Trapani, F. Sgroi and R. Testa, 2014c. Economic evaluation of PDO introduction in Sicilian orange farms. Quality Access Success, 14: 99-103

Tudisca, S., A.M. Di Trapani, F. Sgroi, R. Testa and G. Giamporcaro, 2014d. Role of alternative food networks in Sicilian farms. Int. J. Entrepreneurship Small Bus., 22: 50-63. DOI: 10.1504/IJESB.2014.062130

Tudisca, S., A.M. Di Trapani, F. Sgroi, R. Testa and R. Squatrito, 2013a. Economic analysis of PV systems on buildings in Sicilian farms. Renewable and Sustainable Energy Rev., 28: 691-701. DOI: 10.1016/j.rser.2013.08.035

Tudisca, S., A.M. Di Trapani, F. Sgroi and R. Testa, 2013b. Marketing strategies for Mediterranean winer-ies competitiveness: The case of Pantelleria. Quality Access Success, 14: 101-106.

Tudisca, S., A.M. Di Trapani, F. Sgroi and R. Testa, 2013c. The cost advantage of Sicilian wine farms. Am. J. Applied Sci., 10: 1529-1536. DOI: 10.3844/ajassp.2013.1529.1536

Tudisca, S., F. Sgroi and R. Testa, 2011. Competitiveness and sustainability of extreme viticulture in Pantelleria Island. New Medit, 10: 57-64.

Zipori, I., A. Dag, Y. Tugendhaft, R. Birger, 2014. Mechanical harvesting of table olives: Harvest efficiency and fruit quality. HortScience, 49: 55-58.

Vossen, P., 2007. Olive oil: History, production and characteristics of the world's classic oils. HortScience, 42: 1093-1100.