Unconventional adjustment strategies for rural households in the less developed areas in Greece

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Abstract

International competition in agricultural production is intensifying following the implementation of the 1993 accord of the General Agreement on Tariffs and Trade. The production of conventional farm products in surplus is being discouraged by means of indirect economic disincentives. The Common Agricultural Policy has already adjusted to unprotected national markets within the European Union and greater market orientation is being achieved mainly through price reductions.

Farmers in the less developed areas in Greece, where agricultural activity is still the main source of income and employment, have been responding to policy reforms by seeking part-time employment and income in non-farm enterprises. The adoption of alternative, unconventional farm enterprises that use farm resources in an innovative and quantitatively different way does have the potential for bringing in a new source of income to farm business. For the purpose of this research three adjustment strategies were recognised. The 'conventional' (no change) pathway is based on traditional, region-specific products, production methods and services. The adoption of the 'new crop' pathway refers to the redeployment of resources into new agricultural products, whereas farms on the market integration pathway redeploy resources into new marketing services and agricultural product processing on the farm. The new crop and the market integration pathways are identified as unconventional adjustment strategies.

Results derived from multinomial logit analysis highlight the major constraints and opportunities associated with the adoption of new crops and market integration practices. Farmers who have adopted unconventional practices are influenced by factors external to the farm, such as contacts with institutions, and have a high probability of having higher debts. These farmers are likely to depend heavily on seasonal labour and rented land. The fact that market integration activities are associated with smaller farms in conjunction with off-farm work signifies the importance of establishing an integrated rural development policy approach. Public policy involvement in enhancing dissemination of information concerning unconventional enterprises is emphasised.

1. Introduction

Greek rural areas have been experiencing a range of problems which characterise the least developed regions of the European Union, namely, demographic desertification, low levels of economic activity and depressed standards of living. In general, families running small, non-viable agricultural hold-

ings depend, to a great extent, on off-farm employment to supplement their incomes.

Throughout the last few decades, prior to the country's accession to the European Community in 1981, as well as in the period during which Greece has been a member of the European Union, farmers' incomes were protected by means of sectoral policy instruments of microeconomic character. Price support and subsidies of the means of production dominated the policy measures enforced before the accession, while guarantee schemes and financial aid such

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as production subsidies were continued and expanded during the years of the implementation of the Common Agricultural Policy (CAP) in the country. Grants, intended to improve the efficiency of agricultural structures, proved to be of minor importance and of limited applicability until the restructuring of the structural funds and the application of the Community Support Frameworks I and II from 1989 onwards.

The CAP is being reoriented toward unprotected national markets within the European Union while international competition is expected to intensify following the implementation of the 1993 accord of the General Agreement on Tariffs and Trade (GATT). In addition, the production of farm products in surplus is being severely discouraged by means of economic disincentives such as price reductions and production controls (European Commission, 1994).

In Greece, the importance of agriculture in the economy is still relatively high as revealed by the fact that the sector accounts for approximately 14% of the Gross Domestic Product when the respective figure for the European Union as a whole does not exceed 3%. On the other hand, employment in agriculture still accounts for over 22% of total employment in the country, compared with 6% for the European Union. Greece accounts for about 10% of the total number of farms in the Union.

Greek agriculture demonstrates some unfavourable characteristics and trends. The average age of the heads of agricultural households is very high, approaching 60 years and their basic education and training in farming is very limited. Young farmers show a strong resentment in succeeding their parents in farming activities. Pluriactive rural households account for over 50% of the total number of rural households. Approximately 60% of the total number of heads of households of ages between 30 and 45 years maintain principal gainful activities off the farms. The percentage of pluriactive farmers is expected to rise further. It is estimated that in 10 years from now, over 60% of the current heads of agricultural holdings will have abandoned agricultural activities entirely (Damianos et al., 1991). Farmers who are expected to maintain their agricultural activity will be pluriactive to a great extent. The agricultural sector is about to lose the greatest part of the better qualified human resources and thus, the

prospects for a drastic improvement in the country's competitive position with respect to its agricultural sector are rather gloomy and alarming.

Owing to the degree of trade diversion and consumption patterns observed, the balance of international trade of agricultural products has been negative since the country's accession to the European Community and is approaching the 1 billion dollar mark. The value of imports has been steadily increasing while the value of exports has been very unstable during recent years. Thus, the importance of products of high income and export demand elasticity is stressed.

Farmers have been brought up on a philosophy of increasing yield and intensity, concentrating on the production of conventional products in surplus in a highly protected environment. Thus, production has not adjusted to the needs of the national and international markets. Consumption patterns and product quality in Europe do have direct implications for the type of farming systems that prevail. Farming methods which are new to a specific region or the country demand a new perspective from farmers.

Farmers in the less favoured areas in Greece, just as elsewhere in the European Union, have been responding to prospects for major changes in agricultural policy. The main objective of this study is the identification of the socio-economic features which are decisive for farm families in adjusting their business activities. For the purpose of this research, three adjustment strategies were recognised:
1. maintenance of traditional (conventional) agricultural practices and products;
2. adoption of new crops or new breeds of animals;
3. adoption of activities that integrate the farm's product to the regional and/or national market.
The last option may involve either the adoption of marketing strategies that are new to the area and that deliver the product directly to the consumer, or further processing of the farm's main product. This choice will be refereed to as 'market integration activities'.

2. Theoretical model

For any farmer producing a single tradable commodity it is assumed that output and prices are

random variables and profits are stochastic. A Taylor series expansion of the unknown utility-of-profits function about the mean of profits yields an expected utility-of-profits function with mean (μ), variance (σ^2), and higher moments (σ^k). It is assumed that farmers are risk averse. Each producer's risk aversion attitude can be represented by a coefficient ϕ_i, and the expected utility function can be depicted as

$$EU(\pi_i) = f(\mu, \sigma^2, \ldots, \sigma^k, \phi_i) \qquad (1)$$

Eq. (1) implies that a farmer's profit distribution may be decomposed into a set of observable factors related to its mean, variance and higher moments. We assume that farmers continuously consider a range of alternative agricultural production technologies, especially when they are under economic stress or operate within uncertain economic environments. Such uncertainty is often prolonged by changing agricultural policies. However, the adoption of new technologies can be related to uncertain outcomes. When adoption is discrete, adoption and non-adoption decisions are mutually exclusive. Farmers are assumed to adopt a new technology if the utility of profits expected by adopting a new technology exceeds the utility of profits expected without adoption. In this paper, farmers who face two discrete alternative agricultural technologies are considered.

A farmer may adopt a crop which is new to the region when he subjectively perceives that the product has fairly good marketing prospects at the regional or national level. Alternatively, the same farmer may adopt a technology that will allow further integration of his product to the regional or national market.

Adoption of a new crop is subject to a major constraint related to the farm household's fixed land. The adoption decision is thus a land allocation decision subject to

$$L_0 + L_1 = \overline{L} \qquad (2)$$

where L_0 is the land allocated to the traditional crop, L_1 is the land allocated to the new crop and $\overline{L}$ is the fixed amount of land available to the farm household. The farm household should allocate its fixed amount of land in a way that maximises its expected utility of profits. Furthermore, the adoption of a new crop is associated with any variable adoption cost related to any new input required. It is also associated with any fixed adoption cost related to any new machinery and training requirements for family and hired labour.

For the market integration development strategy, the farmer may treat his traditional farm product as an input to a processing or marketing activity, and thus add value to his agricultural produce. For example, a milk producer may process part or all of his milk production to cheese or yoghurt if he subjectively perceives that there is a good prospect for such final products at the regional or national market. A fresh fruit producer may process part or all of his production to home-made jam for the same reason. Of course, instead of processing the product, a farmer may decide to deliver it directly to the consumer by adopting a non-conventional marketing channel such as delivery rounds, an open market stall, or pick-your-own fruit. The main economic characteristic of market integration activities is that the farm's traditional output is not altered. Instead, value is added to the final product on the farm or the product itself is delivered directly to the consumer, thus being further integrated to the regional and/or national market. This is achieved either by processing the traditional output or by delivering it directly to the consumer. The adoption of such strategies involves one major decision related to the household's time allocation which may be represented as follows

$$T = T_f + T_m + T_h \qquad (3)$$

where T is the total time endowment of each household member, T_f is time devoted to income-earning activities on or off the farm, T_m is the time that may be used for marketing or processing the farm's product and T_h is home time. This constraint takes the form of a strict equality since T_h is a residual including time used for household work and leisure. The farm household should allocate time among traditional production together with off-farm work, the new activity and home time in a way that maximises its expected utility of profits. The adoption of a market integration strategy involves a variable cost related to inputs required for processing or delivering the traditional product and a fixed cost associated with new machinery, and training requirements for family and hired labour.

Maximising the expected utility of profits as ex-

pressed by Eq. (1), taking into account the constraints presented in Eqs. (2) and (3), yields a function which relates the producer's probability P_i of adopting alternative agricultural technologies to a set of observable farm and operator characteristics (X_i) as follows

$$P_i = g(X_i \beta) + \epsilon_i \tag{4}$$

where β is a parameter vector and ϵ_i is a vector representing unmeasured factors related to adoption.

We define U_{i0} as producer i's expected utility corresponding to the adoption of any new crop or market integration strategy, U_{i1} as producer i's expected utility corresponding to the adoption of a new crop and U_{i2} as producer i's expected utility with only the adoption of a market integration strategy. The ith household will adopt the pathway of agricultural development that maximises its expected utility of profits, given the household's constraints. For simplification purposes it is assumed that no household can adopt more than one available strategy. Such an assumption is realistic for the prevailing conditions and farming characteristics. A qualitative variable I_i that indexes the agricultural production strategy decision is given by

$$I_i = \begin{cases} 0 \text{ if } U_{i0} > U_{i1}, U_{i2} \\ 1 \text{ if } U_{i1} > U_{i0}, U_{i2} \\ 2 \text{ if } U_{i2} > U_{i0}, U_{i1} \end{cases} \tag{5}$$

The functional relationship g of Eq. (4) may be of different types. Probit and logit techniques that have proved useful in modelling the adoption of agricultural technology among farmers are utilised. Thus, the probability that the choice of agricultural strategy is j, under a multinomial logit model (Nerlove and Press, 1973) is

$$P_j = \frac{e^{\beta_j' x_i}}{\sum_{k=0}^{2} e^{\beta_k' x_i}} \tag{6}$$

The resulting probabilities for each agricultural technology choice (Greene, 1991a) are

$$P_0 = \frac{1}{1 + \sum_{k=0}^{2} e^{\beta_k' x_i}}$$

$$P_1 = \frac{e^{\beta_1' x_i}}{1 + \sum_{k=0}^{2} e^{\beta_k' x_i}}$$

$$P_2 = \frac{e^{\beta_2' x_i}}{1 + \sum_{k=0}^{2} e^{\beta_k' x_i}}$$

To identify the parameters in Eq. (7) the normalisation $\beta_0 = 0$ is imposed.

An estimation of the multinomial logit of Eq. (7) is easily obtained by means of Newton's method (Greene, 1991b). The log likelihood is derived by setting $d_{ij} = 1$ when strategy j is chosen by producer i, and $d_{ij} = 0$ otherwise, for all three possible strategy choices. As explained, choices are mutually exclusive and thus one and only one of the d_{ij}s will be set equal to 1 for each individual farmer. The log likelihood is (Greene, 1991b)

$$\ln L = \sum_i \sum_{j=0}^{j} d_{ij} \ln P_{ij} \tag{8}$$

A goodness-of-fit measure, based on the likelihood-ratio test statistic, usually reported as McFadden's ρ^2 measure (Maddala, 1983, p. 40), is

$$\rho^2 = 1 - \frac{\log L_\Omega}{\log L_\omega} \tag{9}$$

where L_Ω is the maximum of the likelihood function when maximised with respect to all parameters and L_ω is the maximum when maximised with respect to the constant term only, i.e. setting all the βs equal to zero.

Multinomial logit (MNL) parameter estimates indicate the direction of the effect of each explanatory variable on the response probabilities; however, such parameters do not directly represent the actual probability changes. By differentiating Eq. (7), we find the marginal effects of the repressors on the probabilities (Greene, 1991a) as

$$\frac{\partial P_j}{\partial x} = P_j \left[\beta_j - \sum_k P_k \beta_k \right] \tag{10}$$

The change in probability is a function of the probability itself which, when multiplied by 100 is the percentage change in the probability of the farm

strategy occurring given a change in the variable.

A property of the MNL model, known from the work of Luce (1959) as 'independence from irrelevant alternatives' (IIA) implies that the ratio of choice probabilities for any two alternatives, say r and s (i.e. the odds of choosing r over s) should not depend on whether there are other alternatives available to the farmer. Hausman and McFadden (1984) suggest that omitting a choice or a choice set from the model altogether will not change parameter estimates systematically if the choice or choice set is irrelevant. The parameter estimates obtained when the choice is eliminated will be inconsistent if the remaining odds ratios are not truly independent of this alternative. This is the usual basis for Hausman's specification test where the statistic is

$$x^2 = \left(\hat{\beta}_s - \hat{\beta}_f \right)\left[\hat{V}_s - \hat{V}_f \right]^{-1}\left(\hat{\beta}_s - \hat{\beta}_f \right) \qquad (11)$$

where $\hat{\beta}_s$ is the parameter vector of the restricted subset of choices, $\hat{\beta}_f$ is the parameter vector of the full set of choices and $\hat{V}_s$ and $\hat{V}_f$ are the respective estimates of the asymptotic covariance matrices. The statistic is asymptotically distributed as chi-squared with k degrees of freedom, equal to the rank of $\hat{V}_s - \hat{V}_f$, which is the same as the order of $\hat{\beta}$.

3. The study region and survey data

The study area coincides with the prefecture of Etolia-Akarnania, one of the most rural and agricultural areas in the country situated in the western part of central Greece. The prefecture occupies an area of 5460 km^2 and is inhabited by 230 000 people (1991 census), over 50% of whom live in settlements of less than 2000 inhabitants. More than two-thirds of the economically active population is engaged to some extent in agricultural activity. The 33 000 farms, about half of which are pluriactive, are highly fragmented with a mean size of less than 3 ha. Small size and extensive fragmentation create diseconomies of scale, whereas few farms are suitable for extensive agricultural practices. Small holdings, of less than 2 ha, account for about 60% of the total cultivated area, whereas relatively large farms, of over 5 ha, account for about 15% of the total number of farms and for over 70% of the cultivated area. It is as-

sumed that agricultural incomes demonstrate a similar unequal distribution.

Arable cultivation occupies about 60% of the agricultural land. About 17% is attributed to permanent crops and only 3.5% to vegetables and vineyards. The remaining 20% rests fallow for agronomic purposes. The principal products of the region are corn, wheat, sun-cured tobacco varieties, fodder crops for hay and grazing, cotton, olive oil, table olives, and citrus fruit. Considerable areas are also forested while sheep and goats utilise the extensive mountain grazing. The region has a clear specialisation in tobacco, mainly oriental sun-cured varieties, and does not produce sufficient quantities of products suited for the region's physical endowments, such as fruit and vegetables. The size of the local market and other prospects allows the adoption of new crops and the increase in production of value-added products such as milk by-products (i.e. soft and hard cheese, yoghurt and butter).

The region selected is a "lagging" region on the basis of its high unemployment rates, high net out-migration and low household incomes. The weakness of its rural economy is manifested by several sectoral indicators. Remoteness from major cities, low population density, low skills base for non-farm jobs and a poor structure of farming are all constraints to development. New off-farm opportunities for employment are hindered by the limited local demand for products and services as well as by the region's remoteness. Farmers in the region under-utilise their labour resources to a significant extent, thus acquiring lower incomes than the national average despite substantial state transfers in the form of direct income subsidies. Thus, unconventional farming enterprises, namely the adoption of new crops, on-farm value adding and marketing activities could be sensible strategies given the outlook for agriculture after the recent (1992) CAP reform.

For the purpose of this study 200 agricultural holdings were sampled within the designated study region by means of a two stage cluster sampling method. At the first stage an exhaustive list of all rural communities in the region was constructed. The total number of agricultural holdings corresponding to each rural community was detected by means of the 1981 Agricultural Census. From the list of rural communities the researchers were able to construct a

list of geographical sections of approximately equal size with respect to the number of agricultural holdings. Large communities were split into a number of sections of equal size, whereas smaller communities were combined to form geographical sections of the same size (approximately 100 agricultural holdings each). Fifty such sections from the list of all sections were selected by systematic sampling. For all selected sections a sampling frame was constructed in which all relevant agricultural holdings were incorporated and were identified by the name of the farmer-manager. At the second stage a systematic sample at constant intervals was selected from the list of agricultural holdings. The number of holdings for each section selected was exactly the same (four agricultural holdings in each). The two-stage cluster sample was adopted as the most appropriate method on the basis of the criterion of maximum statistical efficiency and the substantially reduced administrative cost. Data were collected by means of interviews on economic and social characteristics and attitudes from 118 conventional farms and 82 farms that had adopted one of the two forms of unconventional enterprises. Of the 82 unconventional enterprises, 56 had adopted a new crop or a new breed of sheep or goat. Of the 26 farms that had adopted market integration strategies, 10 had pursued open market stall sales, 11 door to door sales and five had adopted further dairy processing activities on the farm. The farms surveyed have a larger mean farm size than that reported by the 1991 Census of Agriculture.

4. The empirical analysis

Selection of one of the three strategies available to farm households in the region of Etolia-Akarnania involves decisions which stem from household-specific constraints and opportunities associated with each strategy, and the economic and technical factors specific to each farm household.

The amount of arable land cultivated by a farm household is a critical factor when adoption of a new crop is considered. The close relationship between the adoption of a new crop and farm size has been demonstrated by Just and Zilberman (1983) who argue that there may be a critical farm size, below which some farms do not adopt the new crop due to

high fixed costs. However, very large farms may not adopt a new crop due to increasing risk, under certain conditions described by Just and Zilberman (1983). Feder (1980) argued that the area allocated to a new crop increases with farm size if absolute risk aversion decreases and thus, adoption decisions take into account the degree of risk and the attitudes of the decision maker towards risk, which in turn is not independent of farm size.

Fotheringham and Reeds (1979) claim that farm size is an important variable in explaining a farmer's choice of a substitute crop. The size of the farm is also related to a farmer's choice of a marketing method. Goodwin and Schroeder (1994) declare that the size of the farm is a statistically significant variable in explaining the adoption of forward pricing methods. Activities that diversify agricultural production, including on-farm processing and value adding activities are concentrated on larger farms (Gasson, 1988; Ilbery, 1991; Ilbery and Bowler, 1993; Shucksmith and Smith, 1991). For the purpose of this work, farm size is measured by the amount of arable land cultivated (ARABLE), including owned and rented, and the amount of arable land rented by the farm household (RENT). The latter also represents the dependence of the farm household on land rents. For the prefecture of Etolia-Akarnania, Daouli and Demoussis (1992) state that land rents increased dramatically after 1981 owing to income capitalisation in land values and the instability of real interest rates. It should be noted that tobacco farmers in Etolia-Akarnania do not depend on rented land, while mixed arable and livestock farms largely depend on arable land and rented grassland.

The household's time allocation between the different farm activities and home is also a major consideration. Most farmers and family members are pluriactive and thus, the extent of off-farm work is likely to be a major determinant in the choice of an alternative farm strategy. Researchers have recently examined the joint farm and off-farm work of men and women (Kimhi, 1994a). The total household's engagement in off-farm work places restrictions on the time available for the development of unconventional enterprises. However, research shows that creating incentives for farmers to work off the farm does not reduce their farm work and their reliance on farm income (Kimhi, 1994b). Furthermore, land size

has a positive effect on farm participation and a negative effect on off-farm participation (Kimhi, 1994a). However, extensive off-farm work provides channels of information flow between the farm household and external work. Depending on the technical properties of the new crop, adoption may have a positive effect on the household's supply to the labour market and a negative effect on its demand for hired labour (Lin, 1994, 1995). Research results confirm the validity of the theory on labour bottlenecks and labour supply uncertainty, which suggests that uncertainty regarding the availability of labour in peak seasons can explain the adoption of a new labour-saving technology (Feder et al., 1985). This may be particularly true in the case of sun-cured tobacco growers, who depend on immigrants for a supply of hired labour during the peak season. Adoption of flue-cured tobacco varieties that require almost half the labour of sun-cured tobacco varieties (Ziogas et al., 1992) may be a risk-reducing strategy, especially in Etolia-Akarnania where seasonal labour is supplied mainly by immigrants from neighbouring Albania which is very vulnerable to political changes. Finally, it has been assumed that part of the fixed cost of the adoption of an unconventional strategy refers to the training of family and/or hired labour on the new agricultural production situation, crops or processes. Two labour variables are incorporated into the model, namely the household's off-farm work measured in annual work units (PLUR) and the amount of hired seasonal labour measured in annual work units (SEASON).

The variable cost of the different industrial inputs (fertilisers, pesticides, etc.) does not show significant variation among farmers due to the co-operative system of farm supplies delivery, which is applied in a uniform manner. However, spatially differentiated costs may be reflected by the different transportation costs and more specifically, by the distance of the farm household from the locations of agricultural suppliers, as well as the locations of agricultural product delivery. Previous work on farm diversification, the adoption of new varieties and on-farm activities highlighted the importance of proximity to main roads and urban centres for the development of alternative farm enterprise strategies (Ilbery, 1988; Shucksmith et al., 1989; Edmond et al., 1993). In this work, the distance from the farm to the nearest

urban centre in kilometres (PROX), is used as a proxy variable representing the farm's proximity to agricultural supplies markets and access to prospective markets for unconventional practices (processed products, alternative marketing strategies, etc.).

Access to credit is critical for a farm household in order to manage the high fixed costs associated with the adoption of an unconventional agricultural strategy. Green and Ng'ong'ola (1993) show that access to credit is a statistically significant variable which explains the adoption of an innovative fertiliser among Malawi farmers. In this study, a dummy variable indicating whether current debts of farm households are below or above one million Greek drachmas is considered (DEBT). It is assumed that debts of more than one million Greek drachmas is an indication that the farm household has access to, and makes frequent use of credit services.

Extension and institutional contacts have been considered in adoption studies and showed a high correlation with the adoption of new technologies (Green and Ng'ong'ola, 1993; Shakya and Flinn, 1985). The mean number of contacts a farmer has in 1 year with extension and credit organisations that also offer extension services in Greece is realised in the variable CONT.

As previous research suggests, human capital is critical to the adoption of new crops and the adoption of on-farm processing and marketing strategies, as it enhances the farmers' ability to search for alternatives (Keating, 1989; Cawley et al., 1995). Such a factor has been frequently represented by the number of years in formal education and/or training (Lin, 1991a; Shucksmith and Smith, 1991; Shucksmith, 1993). Shaha et al. (1994) showed that the age and education of a farmer are the two most important factors in explaining whether a producer is familiar with an agricultural technology or not. Such information was not utilised in this study because the farms sampled displayed a high degree of uniformity with respect to such characteristics. Lin (1991b) points out that the adoption of hybrid rice in China was influenced by past experience, which proved more important than profitability. In the present study, the agricultural experience of a farmer (EXPER), expressed in years, was measured as the difference between the year the farmer declared he undertook full administrative responsibility for the farm and the

year the survey was conducted. This variable may not measure the agricultural experience of the producer precisely, but it may be assumed that it measures the managerial ability and experience of a producer in farm management. As in other studies (Goodwin and Schroeder, 1994) it was realised that age and years of experience are highly correlated and thus we decided not to include an age-specific variable in the present analysis.

5. Results

Table 1 lists the variable names, their definition and descriptive statistics for the whole sample. Table 2 presents descriptive statistics for the same variables for each choice of agricultural business development strategy. The empirical MNL model of Eq. (7) was estimated using the LIMDEP (Greene, 1991b) statistical package. Maximum likelihood estimated coefficients, and corresponding t-ratios are shown in Table 3. The likelihood ratio test is highly significant with a score of 144.6, and the corresponding ρ^2 of Eq. (9) is 0.387, indicating a very satisfactory fit (McFadden, 1979). The model correctly predicted 82.5% (165/200) of the responses. Correct predictions were relatively higher for the group of farmers that did not adopt any unconventional farm business development strategy (92.4%, 109/118) than for the new crop adoption group (66.1%, 37/56) and the on-farm processing and alternative marketing adoption group (73.1%, 19/26). The lower percentage of explanation for the two unconventional choice groups is explained by the relatively smaller number of farmers in these groups which magnifies the significance of minor variations and makes the modelling of the determinants of these choices more difficult than for the other two categories. The IIA test, presented in Eq. (11), was carried out using a restricted choice set without the new crop as well as without market integration farmers, respectively. The corresponding test statistics were 0.650 and 1.252. Therefore, the null hypothesis of independence from irrelevant alternatives cannot be rejected and, thus, the MNL appears as an appropriate specification for modelling farm development choices. The results of estimating Eq. (10) are presented in Table 4. The estimated marginal probability responses were in conformity with previous research results cited above.

Farm size (ARABLE) is positively related to the choice of maintaining traditional enterprises. An increase in farm size by 1 ha increases the probability of the traditional choice by 2.26%. As expected, farm size is inversely related to the choice of market integration strategies. However, farm size is not statistically significant for the new crop adoption choice and thus previous findings relating farm size to the adoption of new agricultural technology (Feder, 1980; Just and Zilberman, 1983) are not confirmed. The size of the arable land rented by the farm household (RENT) is positively related to the market integration strategy and is not statistically significant for the other two choices. Adoption of market integration strategies may be associated with a land rent avoidance strategy.

The amount of the farm household's off-farm annual work units (PLUR) is not statistically related to any of the two unconventional choices. Thus, previous research evidence, according to which the off-farm supply of labour does not place major restrictions to on-farm participation and the adoption of unconventional practices (Kimhi, 1994a,b; Lin, 1994, 1995) are confirmed. The amount of seasonal hired work (SEASON) is positively related to the adoption of the two unconventional strategies and negatively related to the maintenance of traditional enterprises. It may thus be assumed that adoption of unconventional strategies for the specific region is a labour saving practice. It is also assumed that the cost of training hired labour is not considerably taken into account when adoption decisions are considered.

Proximity is assumed to reflect variable transportation costs for inputs (fertiliser, pesticides) and transportation costs for marketing the produce. Proximity (PROX) may also reflect access to information sources, extension and other services (credit, insurance, etc.). Proximity is significantly related only to the choice concerning the adoption of a market integration strategy. An increase of the distance between the farm and the nearest urban centre by 10 km decreases the probability of adopting such a strategy by 3.3%. The level of the farm's debts shows a statistically significant positive relationship with the adoption of a new crop. This indicates that farms which adopt a new crop are more likely to have debts of more than one million drachmas,

Table 1
Variable definition and summary statistics

Variable name	Definition	Frequency in sample	Mean	SD
ARABLE	Total arable land in hectares		4.70	7.62
RENT	Percentage of irrigated to total utilised agricultural area		3.20	6.08
PLUR	Annual work units of off-farm work from all household's members		0.48	0.63
SEASON	Annual work units of hired seasonal work		0.21	0.52
PROX	Distance of the farm from main urban centre in kilometres		23.95	16.15
DEBT	Dummy variable with a value of 1 if farm's debt is more than 1 million Greek drachmas and 0 if less than 1 million drachmas	0 = 119, 1 = 81	0.41	0.49
ORG	Number of contacts with agricultural institutions in 1 year		1.77	1.34
EXPER	Farmer's experience in farm administration, in years		19.38	11.60

Table 2
Summary statistics for each farm development strategy chosen by farmers in sample

Variable name	Conventional choice			Adoption of new crop choice			Market integration choice		
	Freq. in sample	Mean	SD	Freq. in sample	Mean	SD	Freq. in sample	Mean	SD
ARABLE		5.19	9.36		4.44	3.87		3.00	3.82
RENT		3.28	6.58		2.52	3.13		4.56	8.18
PLUR		0.46	0.62		0.37	0.57		0.81	0.73
SEASON		0.07	0.16		0.32	0.78		0.63	0.60
PROX		25.89	17.87		19.98	12.82		23.73	12.99
DEBT	0 = 91 1 = 27	0.22	0.42	0 = 11, 1 = 45	0.80	0.40	0 = 17, 1 = 9	0.34	0.48
ORG		1.89	1.27		1.11	1.20		2.65	1.29
EXPER		20.82	12.84		17.62	8.64		16.61	10.56

Table 3
Parameter estimates of the MNL model

Variable name	New crop adoption choice		Market integration choice	
	Est. coeff.	T-value	Est. coeff.	T-value
ARABLE	−0.056	−0.982	−0.286	−2.017
RENT	−0.045	−0.767	0.085	1.941
PLUR	−0.514	−1.444	0.522	1.342
SEASON	4.208	3.425	5.476	4.397
PROX	−0.015	−0.992	−0.058	−2.404
DEBT	2.525	5.232	0.707	1.086
ORG	−0.484	−2.651	0.793	2.886
EXPER	−0.012	−0.630	−0.045	−1.559
Constant	−0.702	−0.982	−2.087	−2.017
Log-likelihood ratio test			144.6	
L_{Ω}			−114.3	
L_{ω}			−186.6	
McFadden's ρ^2			0.387	

Table 4
The effect of independent variables on the change in probability

Variable name	Conventional	New crop	Market integration
ARABLE	0.023	−0.006	−0.017
RENT	0.004	−0.011	0.006
PLUR	0.070	−0.111	0.041
SEASON	−0.997	0.734	0.263
PROX	0.005	−0.002	−0.003
DEBT	−0.485	0.487	−0.002
ORG	0.052	−0.110	0.058
EXPER	0.004	−0.002	−0.003

which is also an indication that such farms do have access to credit.

Results concerning the variable measuring frequency of the farmer's contacts with extension and service organisations are important as expected. The probability of adopting a market integration strategy increases as contacts with agricultural institutions increase. However, the probability of adopting a new crop decreases as the number of contacts increases. Previous research findings point to the opposite direction (Cawley et al., 1995) or, in the case of fertiliser adoption, do not present any statistically significant relations (Green and Ng'ong'ola, 1993). A tentative explanation may be that agricultural institutions do not promote the adoption of new crops due to uncertainty and caution and strong risk aversion attitudes.

Managerial ability as implied by experience in farm management was not found to be a statistically significant variable in any of the two unconventional choices. Furthermore, the sign indicates that as experience increases, the probability of adopting either one of the two unconventional choices decreases. Such a result is justified on the basis of two complementary explanations. First, experience reflects age and thus long experience is an indication of older age. Older farmers are more likely be reserved and reluctant to take up new production practices and/or new enterprises on the farm. Second, experience may be thought of as an indicator of human capital accumulated through 'learning by doing'. An older farmer who has a long experience and has accumulated human capital by practising certain production techniques associated with specific traditional products would be willing to adopt a new unconventional

product or technique only if expected benefits are substantially higher.

6. Discussion and conclusions

Farms in disadvantaged areas in Greece adopt unconventional farm practices to a significant extent. The farms surveyed lack the resources required for expansion and thus any decrease in farm prices and subsidies will undoubtedly lead to a decline in farm incomes. This is especially true for farms practising traditional enterprises whose low profitability and gloomy prospects have created an interest in the expansion of new crops and market integration strategies. This study enumerated and analysed the various forces which affect the transition to unconventional agriculture with all its implications for further viability and competitiveness. In the study region examined, unconventional farming enterprises are fairly restricted and refer mainly to the adoption of new crops such as flue-cured as opposed to sun-cured tobacco varieties. Market integration activities are not well developed.

Farm development, in the form of new crop adoption and market integration strategies, is more probable on dynamic, not necessarily large, but well situated farms.

The fact that unconventional activities are associated with smaller farms, in conjunction with off-farm work, signifies the importance of establishing an integrated rural development approach in such areas. Off-farm work declines on better farms where the adoption of new crops is more attractive. However, agriculture is still the most important source of income and employment in the disadvantaged areas in Greece and improving incomes in the industry has direct positive impacts on the well-being of these areas. Farms practising traditional agriculture are suffering various restrictions which have been imposed upon them by policy reform and thus it is very unlikely in the foreseeable future that they will be given the opportunity to expand production. In the long run, the decrease in prices and the elimination of subsidies might accelerate the structural adjustment process and the trend towards larger but fewer farms. In the meantime, however, the adoption of unconventional farm enterprises might be the means for wealth creation.

One option that may attract a considerable number of farmers, but which is not widely present in contemporary Greek agriculture, concerns the introduction of extensification activities (Fanariotou and Skuras, 1989, 1991). Such schemes are expected to have a significant impact on a certain group of traditional farmers that are currently practising "winding down" activities and are lacking a strong financial incentive for retirement. Extensification activities will have, in the long term, profound impacts on the enhancement of agricultural environment, the landscape and countryside stewardship in general. This development will increase the attractiveness of the area and may generate further market integration activities or other on-farm non-agricultural activities in the form of rural tourism services (serviced accommodation, self catering accommodation, open farms, farm house teas/cafe, sports, etc.).

Research findings indicate that encouraging the participation of farmers in the process of new crop adoption and market integration activities should be a goal of public policy. This study's findings emphasise the importance of public policy involvement, in the form of agricultural institutions, in increasing adoption rates of unconventional enterprises. The results confirm the importance of institutional support in encouraging innovation and development in marketing integration activities, an issue which has also been brought up in the literature. As the role of unconventional enterprises becomes more important, information regarding alternative production practices and marketing directed to the specific needs of this segment of agriculture should become more readily available (Babb and Long, 1987). There is also scope for improving proper entrepreneurial skills, a critical factor for success in alternative agriculture.

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