Agricultural Agent Land-Use and Land Ownership Behavioural Analysis: A Casa Study from a Southern Italian Region

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ABSTRACT

The recent CAP reform introduced new income support instruments much more related on agricultural agents land-use and land-ownership conditions than before.
In this perspective the behavioural analysis of land-use and land-ownership decision process seems to be a basic condition to evaluate the efficiency, effectiveness and equity of those instruments, and to understand and to forecast the agents response to these stimuli.
The land-use and land-ownership behaviour differs according to various land managers, not only on the base of "economic-productive" conditions, but also on the base of exogenous and endogenous "institutional" conditions, such as the presence of formal or informal contracts, cultural values, intergenerational linkages, family-farm organisation and land-market imperfections and regulations.
In this study an analytic methodology is presented together with an explanatory model which both try to show the role and the relationships between the various land-use and land-ownership driving factors at an agricultural agent level. It is also showed the different behavioural response to the exogenous stimuli coming from the "economic-institutional" environment, in which the agents operate.
The model was tested in a Southern Italian region case study. In the first part of the analysis the various "economic-institutional" environment typologies, in which the region is articulated, were detected, on the base of official census data at the communal administrative units level. The Factorial Analysis through the Principal Components Analysis and Groups Analysis, is the analytic methodology used for this aim.
In the second part of the analysis two specific "environments" were chosen in which the empirical survey was led at the agricultural agent level. The data coming from the survey were used to test the behavioural explanatory model.
The results showed not only some specific "behavioural" paths which may be detected in the two different environments, but also deep differences among the various typologies of agricultural agents inside the same environments, depending on the "economic-productive" size, the presence of strong familiar roles, informal contracts for hiring work and renting land, the specific history of the agricultural agent, the perception of land as a productive factor, an investment good or a "social status symbol". The results are presented in the last part of the article.

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1 INTRODUCTION

The recent CAP reform establishes a gradual decoupling of agricultural supports from the quantities actually produced, introducing a single payment related to land ownership and to the rights accrued in a set period. Two major consequences could derive from the introduction of this support system:
1. An increase of land market inelasticity for entitled land plots, partially due to the capitalization of the support-rights in the land value.
2. An increase of rented land surfaces in case of not entitled land plots.
The productive systems and major/minor market mobility will be modified as a result of choices strictly depending on conditions related both to the context in which the "production-unit" operates and its specific features. From this point of view it is important to analyse the overall dynamics characterizing the use-choices, and therefore the choices about the cultivation types as well as the choice to transfer, temporarily or definitely, the farm land ownership rights.
This work, mainly, aims at investigating possible connections between land use, land ownership choices and a series of features related to a single farm (endogenous factors), and its economic-institutional environments (exogenous factors). It also aims at the identification of the factors actually decisive for the choices and the definition of a behavioural model which offers an explanations of the dynamics, and gives indications on public intervention policy.
The stating hypothesis is that the land use and ownership choices of the agricultural production-unit may be analysed as the action of a complex system, composed of two main components: the anthropic and natural systems. The former is represented by all the economic, social and organizational relationships, regulating the system action; the latter is represented by all the natural resources on which the production unit has the use and ownership right.
The land use and ownership choices can therefore be considered as a result of specific features of both the anthropic and natural systems, and their combination constitutes the land use system of that particular production-unit. This analytical perspective offers the advantage of making it possible to study the complexity and variety of situations regarding land use and ownership choices, using a single interpretative scheme. It also assigns a specific role to the many components of the system (i.e. family, productive choices, land market dynamics, presence of traditions, cultural values etc.); it avoids the limits of a partial analysis or the risk of emphasizing the role of a particular component. Moreover this system allows, at the same time, to analyse two behavioural dynamics such as the land use and ownership choices that seems to be interrelated and are usually studied separately. The analytic methodology used in this research consists of two steps: first the features of the production-unit economic-institutional environment were determined. Secondly the behavioural differences of production-units belonging to different systems, were identified analysing the history of the farms and the choice determinants both inside and outside the production-units. The identification of the economic-institutional environments corresponding to the sub-regional systems was made on the basis of official census data available at local administrative level and using Principal Component Analysis (PCA) and Group Analysis. The "typical" behaviours characterising the sample units in the two areas, where a survey was carried out, were identified trough the analysis of the changes occurred over the years, in relation to the ownership-type. At last the analysis of the driving factors was carried out using a discrete-choice model.

2 EXPLANATORY MODEL

2.1 Theoretical framework

The dynamics related to land use in agricultural economics have always been considered a part of a wider analysis of different forms of farm management and of their economic efficiency. This sort of analysis has mainly dealt with the description of the

different ways that define the relationship among resource-owners participating in the farm production process (Cecchi, 1991). This analysis has long been developed using "tout court" the theoretical and analytical apparatus of neoclassical microeconomics (De Benedictis, 1993). According to this theoretical scheme decisions are taken by an entrepreneurial figure that may be represented by one or more agents, in relation to different forms of contract. The relationships inside the firm are regulated by the obligation between the person who has got an ownership right and therefore grants the right to use the resource, and the person involved in combining resources in production process. The person who is granted the right of use has to take his/her decisions in the respect of the contracts accepted for the resource use. Payment for the resource use is regulated by market condition, that are supposed to be perfectly competitive. According to this assumption payment for each resource is represented by the marginal productivity value of that resource (Cecchi, 1991).
The neoclassical approach highlights the differences in the decision making process observed in different management forms. When, for example, there is a separation between owner and entrepreneur the overall choices of a farm may be influenced by the owner, far beyond the limits by the obligation to payment. The ownership right on the resource might lead to the right to influence the choices related to: farm management, productive planning typologies, work-control system, marketing and commercialization of goods; all these choices can influence the final payment for the resource use. Each farm typology might, therefore, show a different land use behaviour even under the same management system. The neoclassical approach also states that the conditioning factors are mainly endogenous, as they referred to the system of relationship between owners and decision-makers. The absence of significant exogenous factors is due to the implicit assumption that the context in which the single production-unit operates, is considered homogeneous, because perfect market conditions and the absence of specific resources (information for example) are implied. Besides, in the above mentioned approach, differences in resource quality, which can be particularly important in case of work and land, are not taken into account. There is, instead, the assumption that, except for the entrepreneurial abilities of the decision-makers, goods and production factors are basically homogeneous.
In the present work this analytical perspective has not been adopted and I decided to focus on the choice process, trying to establish a connection between farm endogenous and exogenous features and land use and ownership change decision. This analytical choice is based on the idea that for several reasons the behaviourist hypotheses proposed by the neoclassical approach cannot fully explain and interpreter this phenomenon. First of all competition condition may not be perfect, either in the market of goods and production factors, especially with reference to land. The ownership right transaction on this resource, in fact, may be strongly influenced by information asymmetries, high transactional costs, and free-riding problems (Deininger and Feder 2001). Secondly land can represent a very important element included in the investment portfolio of the farmer and his/her family. Moreover land can be potentially used for the access to the market of other production factors; in this case it is considered a "collateral" property (Deininger and Feder 2001). At last specific characteristics of these properties may lead agents to deviate from behaviours only aiming at "optimization", these features being: uniqueness, indestructibility, lack of homogeneity, influence of tradition, sentimental and heritage values, social prestige (Hubacek and Vazquez 2002). This research aimed at verifying which factors actually influenced farmers' behaviour and to what extend.

2.2 Explanatory model description

The analysis of the motivations on which the land use and ownership choices are based can therefore take into account a set of endogenous and exogenous driving factors which don't consider land only as one of the resources used in the agricultural production process, but a larger set of the elements that can have a potential role in the decision making process:

1. Contractual relationships about property rights on land and other resources belonging to the farm

2. Market characteristics of these resources
3. The decision making process
4. The overall farm strategies
5. The general conditions of the context in which the land managers make their choices
6. The non-economic characteristic that may be associated to land

This study intends to evaluate a positive or negative attitude towards modification of land use and ownership modalities, making the hypothesis that such a behaviour represents a choice of decision making unit under the influence of a set of factors. For this purpose it is necessary to define three basic elements: the decision maker, the object of the choice, the way in which the presence or absence of the choice is to be tested. This elements can be identified if the production unit is considered as a complex system composed of agents, resources and roles which interact influencing each other. In particular we can distinguish a first component of the "system-production unit", the atrophic system, made up of the decision making unit (either a single agent or a group), the set of relationships with the resources owners (land, work and capital), and the relationships with the context.

A second component is represented by the natural resources belonging exclusively to the production unit in relation to ownership and use and by natural environment resources (air, climate, landscape) which can be considered public property. The features of the anthropic and natural systems, the way they interact and the interaction rules will influence the decision-making unit's choices about resource ownership and use.

The characteristics of the anthropic system can be classified as follows :

organization structure and decision-making nucleus features, definition process of behavioural strategies. The organization structure of the production unit can be described analysing first of all the decision-making nucleus composition and the importance of family ties and family dynamics. As for this aspect family groups can be classified in relation to their complexity: families composed of one farmer or by husband and wife will interact in a much simpler way than larger families. The different degree of complexity will correspond to great differences among various production units as regards work sharing and income production. Another major difference influencing family choices may correspond to the presence or absence of different generations among family members. These family ties can, in fact, influence the "time horizon" of farm decision; the choices might consider not only the short but also the long run and they might be significant for the present management but also for the farm future.

In the behavioural analysis of production units it is important to take into account the opportunity to transfer the activity from a generation to another, as this fact involves psychological and social aspects. Family choices, regarding both investment and production, may be influenced by strong family traditions, relationships among members and intention to carry on the activity. The decision making process deriving from the above factor may, therefore, vary remarkably in relation to the family influence and complexity. In general a lower or a higher participation degree in the decision making process can be detected according to the prevalence of cooperative or conflictual attitude inside the group.

The relationships between the production unit and context (exchange relationships) can be analyse through system coordination mechanisms, with a particular attention to the finding of productive factors and commercialization of goods. The coordination mechanism can be analyse in two main ways: recourse to market or to contract either with public or private organization. This distinction is particularly useful to evaluate the exchange of production factors and goods. The prevalence of a mechanism over another will depend on the production unit and context features, that act as an exogenous stimulus on the production unit system.

The land use system is determined by the combination of the following elements: regulations of land ownership rights, farms size (extension and fragmentation of land plots), the typology of land cover (productive planning, housing use, abandoned land). This elements are useful to evaluate if and how the system is inclined to change, which can influence the actual changes carried out by the decision making unit. The system showing steady ownership rights regulations, based on individual and enduring ownership (land ownership),

can be considered less inclined to change, like the ones that adopted permanent cultivation planning.
In the explanatory model here presented there is the assumption that a decision maker can be identified in the decision making unit inside the anthropic system; the choice will refer to land use and ownership modalities, which represent the land use system. In conclusion the choice behaviour will be influenced by a series of stimuli inside the production unit - system represented by: the features of the anthropic and natural system; the specific resource use system; a series of exogenous stimuli coming from the "economic-institutional" environment.

3 A CASE STUDY

The explanatory model was tested trough an empirical analysis using the data collected through a field survey on a sample of farms located in two different economic-institutional environments of Campania, an administrative region in Southern Italy, divided into 5 provinces and 551 munipalities. The survey was divided into two parts. In the first part the various "economic-institutional" environment typologies, in which the region is articulated, were detected, on the base of official census data at the communal administrative units level. The Factorial Analysis through the Principal Components Analysis and Groups Analysis, was the analytic methodology used for this aim. In the second part the empirical survey was led at the agricultural agent level. The data coming from the survey were used to test the behavioural explanatory model. The survey sample was made up of 103 agricultural production units of which 71 located in AREA 1 and 32 in AREA 2.

3.1 Identification of the survey areas

As far as methodology is concerned, the main problem was to decide how to evaluate the effects of endogenous and exogenous factors. The combined evaluation of a range of factors referring to different territorial scales and agents presents, in fact, two types of problems: it is difficult to evaluate and quantify the effect on a single agent of a characteristic which can be observed only on a territorial scale; there is a plurality of direct and indirect factors that can potentially influenced the choice process. To solve these problems a simplification was made, identifying in the location of the production unit the synthesis of potential exogenous effects represented by the economic-institutional environmental features. The location in a certain "environment" is, therefore, considered an indicator capable to give the necessary information to understand to what extend the context might influence the production unit decisions. The identification, definition and classification of the different environments was obtained through an analytic technique already used and tested to determine homogeneous territorial systems at a sub-regional level (Cannata and Forleo 1998). This techinique implies the identification of a range of socio-economic and geographic features related to administrative local units, which represent the base variables. The database obtained in this way was then used for a Principal Component Analysis (PCA) in order to get a synthesis of the information detected at base level. This synthesis is represented by the Principal Components (the synthesis variables). On the basis of this information the synthesis variables were used to make a Group Analysis. In this way it was possible to identify a group of municipalities homogenous in relation to the main differentiation factors identified in the PCA. These homogeneous groups represent the economic-institutional environments of the region. The base variables used for the determination of territorial differentiation factors are 40 in total and are related to 4 different typologies: geographical, economic, demographic, social and agricultural features (see table 1).
Starting from these variables 5 macro-factors or synthesis variables were identified, which were given a certain meaning in relation to a greater connection with some of the base variables. The first factor (*FACTOR 1*) represents the urbanisation degree, a quite low life standard and presence of intensive agriculture, specialised in vegetable growing. *FACTOR 2* represents the degree of tourism activities, a high life standard, high estate value and high individual income level. *FACTOR 3* corresponds to a medium degree of urbanisation, agricultural activities specialised in animal breeding and a prevalence of tenancy contracts.

FACTOR 4 represents an high level of industrialisation, medium level of tourism, agricultural activities specialised in vine growing and presence of small farms.

TABLE 1 Base Variables Used in the Regional Analysis

Variable	***Demografic features:***	Variable	***Geografical features:***
1	Population density	21	Average comunal height
2	Total population	22	Distance from the principal administrative centre
3	Population variation from 1991 to 2001	23	Comunal surface
4	Average size of families		***Agricultural features:***
5	Share of residential houses on total	24	Share of farm used surface on total surface
	Economic features:	25	Work-intensity per surface
6	Share of commercial firms	26	Work-intensity per farm
7	Share of industrial firms	27	Share of seed growing on annual crops
8	Total firms variation from 1991 to 2001	28	Share of vegetable growing on seed growing
9	Number of workers in industrial sector	29	Share of olive growing on permanent crops
10	Number of workers in pubblic admistration	30	Share of grape growing on permanent crops
11	Average number of turist per year	31	Share of seed growing on farm used surface
12	Rate of touristic structures use per year	32	Average farm size
13	Average number of people in holiday houses per year	33	Farm density per sq. Km
	Quality of life:	34	Average number of land plots per farm
14	Bank deposits per person	35	Share of farm owned land
15	Number of hospital beds per person	36	Share of agricultural land use
16	Number of cars per person	37	Farm variation from 1991 to 2001
17	Number of cars over 2000c.c. per person	38	Farm land variation from 1991 to 2001
18	Share of pubblic TV yearly enrolement per family	39	Average number of cows and buffaloes per farm
19	Estate value per person	40	Average number of sheep per farm
20	Income per person		

FACTOR 5 represents a low degree of socio-economic dynamism, and agricultural activities based on fruit growing and animal breeding.
After that, a non hierarchical Group Analysis was carried out in order to identify groups of homogeneous munipalities according to the five synthetic factors above mentioned. In the Campania region six main groups were identified. Each group was attributed a series of characteristics according to the value of the centroids, that represent the average value of each variable inside the group and, therefore, they represent the synthesis of the features the observations have in common.

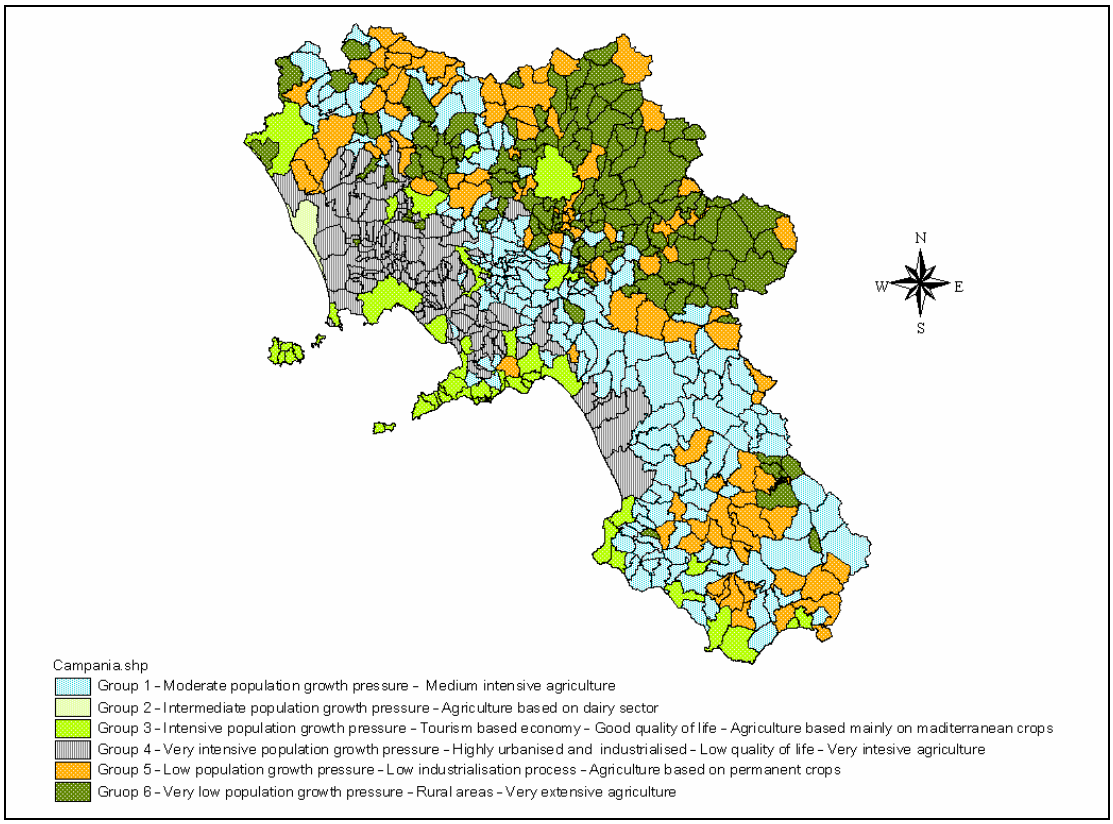
TABLE 2 Group Analysis: Value of Centroids

Cluster	**Num. of communal units**	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**
1	171	-0,24	-0,09	-0,70	0,08	0,54
2	1	0,73	2,04	7,62	-1,07	6,48
3	51	0,69	2,06	0,08	0,85	-0,20
4	114	1,34	-0,53	0,31	-0,43	0,00
5	91	-0,87	0,36	0,15	-1,13	-0,34
6	123	-0,55	-0,53	0,48	0,78	-0,47

On the basis of the results the characteristics of each group were defined. Group 1 represents a group of municipalities characterized by low population density, social and economic marginality, where the agricultural sector is based on animal breeding and specialized fruit growing. In this group farm land is mainly owned b the farmers. Group 2 is represented a single municipality characterized by a medium degree of urbanization, agriculture is mainly based on animal breeding and specialised fruit growing. Group 3 is represented by tourist resorts with a high individual income where the main agriculture activities are vegetable and olive growing. Group 4 is represented by munipalities with high population density and high urbanisation, a low life standard and an very intensive agricultural sector. Group 5 is represented by not much urbanised and industrialised municipalities with a certain degree of

tourist activities and agriculture based on permanent cultivation. At last Group 6 refers to municipalities where rural and agricultural activities are significant.
On the result basis the survey areas were identified and the choice refered to one area belonging to Group 6 defined SURVEY AREA 1, and some municipalities in Group 3 defined SURVEY AREA 2. The reasons for this choice were based on the idea of analysing the behaviour of production units located in two very different economic-institutional environment in which agricultural activities are significant from both in economic a social point of view. The determination of the features of the single areas was carefully made analysing the features of the munipalities involved in the survey.

FIGURE 1 "Economic-Institutional Environments" of Campania Region



Area 1 is an economic-institutional environment where agricultural activities are predominant; it is characterised by a certain degree of underdevelopment and a quite low economic and social dynamism. Farms have an average extension of 6 ha, with 99,7% of family-farm organization. The farms with land totally owned by the farmers represent 82,8%, while 13% referred to farmers with a tenancy contract. The most common activities are animal breeding, cereal, tobacco and wine growing. In this area the pressure on land use from non agricultural sectors is limited. In some municipalities some small and medium size factories are located. This fact may exert a pressure on land use and promote change in primary sector as it offers more opportunities of getting part-time jobs and in this way integrate the family income.
The municipalities belonging to Area are located an economic-institutional environment characterised by significant tourist activities with limits imposed by landscape protection regulations. In this area tourist activities produce widespread welfare and socio-cultural dynamism. Here women frequently participate in agricultural sector activities and many agricultural workers integrate their income working part-time in the tourism and service activity. In general farms are quite small (about 1,1 ha), mainly with a part-time management and highly specialised cultivations (olive, walnut, citrus fruit growing). Animal breeding is "without land", i.e. stock farms don't grow their own forage but completely depend on other production area of the region. In this area agriculture is considered a valuable instrument for

the territory protection and landscape preservation. In short, the farms located in area 1 operate in an environment where exogenous stimuli can be represent by a low pressure on land coming from other productive sectors. In this area social relationships are quite traditional and land ownership can be considered a sort of "status symbol". Besides the prevalence of family-farm organization and the lack of other job opportunities may show the strength of highly conditioning family ties. On the contrary, in area 2, the agricultural sector has a marginal role in the economic system but is extremely important for landscape protection and hydro geologic defence. Non agricultural activities, in particular tourism and housing use, exert a high pressure on farm in relation to land use; as a consequence land value is very high and this fact if on one hand increases the importance of land as an estate, on the other, diminishes the opportunities to extend the cultivated surface either owned or rented. Moreover better opportunities to work in other sectors act as a negative stimulus to abandon farming but as a positive stimulus to reorganise farm activities (for example farm holidays, production improvement and in farm commercialisation activities).

3.2 Sample features

The 103 production unit involved in the survey are family-farm organizations, in which the farmer has the formal role of entrepreneur but also works inside the farms. The organization structure is influenced by the number of family members and by their participation in the management choices. The 85% represents families made up of at least 3 members, while the remaining 15% are family made up of the only farm or by husband and wife. 75% of the sample is also involved in off farm activities, while workers are mainly family members in 72% of the cases. An organization based on family links also result significant if we evaluate intergenerational links in relation to the origin of production unit and presence of successor. In 81% of the cases was already a family tradition, while only 19% starter the activity from the beginning. A limited number, about 10% of the sample, formally declared the existence of successor. The importance and the influence of family links were detected also in relation to the typology of decision making process, in fact, in many cases the farmer share the main decision about management and investment with his/her family, and sometimes involves collateral relatives as well. Only 6% of the farms, in fact, stated he/she decides on his/her own, 4% shares only production but not investment choices. 25% shares only strategic choices but remaining 65% curries out an extended cooperative decision making process.

As for the exchange relationship with the context, some specific aspects were taken into account: the way the production unit employs workers outside the family, how the land is rented, if the unit participates in agriculture development program supporting by public founds, how the goods are commercialized.

As regards the typology of work, 58% of the sample, employing hired workers, makes use of formal seasonal contracts, while the rest uses informal contracts based on work exchange, crop sharing, occasional monetary payment. As for the land lease the survey pointed out the presence of a significant number of informal rent contracts between relatives or neighbours for a one or two year period (about 1/5 of the all sample).

The participation in publicly funded programs for agricultural and rural development involves a little more than half of the sample (53%). Goods are commercialised trough a mixed system and varies in relation to the type of product. The most widespread way is trough local market (67%), cooperatives and processing industries (64%) or hole sale traders (35%). In general the production units did not show a great dynamism as regards production improvement and efficient commercialization strategies. Only 7% of them, in fact, makes us of quality labels, while only 29% transform and sale goods on the farm.

4. RESULTS

4.1 Behaviours in the two survey areas

A first evaluation of the choice behaviour related to the land use system was made analysing the history of the production units in the two environments. In area 1 the production units were formed starting from small estate already existing before th1 1940s - 50s, which were afterwards enlarged joining family estate together or buying small neighbouring estates. In general this process was carried out over the years by the previous generation and went on till the mid 80s. Land was often purchased from relatives (18% of sample) in order to avoid land fragmentation which is, however, a significant phenomenon.
In area 2 long term tenancy contracts are more common and in many cases previous share tenancy was converted into new rent agreements. Share tenants were often granted ownership rights on a small part of the farm as an incentive to terminate a share tenancy contract a head of time. Also in this respect the farmer's parents were generally more dynamic then their children. In this area no strategies to limit land fragmentation were detected, not even inside families, because of the high land prices. The most common behaviour is family lease, with either formal and informal contracts. A different behaviour in the two area was also proved by group analysis based on land use dynamism and location. A Chi-squared test was used to verify the hypothesis of the independence of variables. The following table shows the results:

TABLE 3 Relationship between Location and Land Use Dynamism

Location	Groups based on land use dynamism		*Total*
	Static or less dynamic	Dynamic	
Area 1	30	41	71
Area 2	23	9	32
Total	53	50	103

a. Note: $\chi 2$ =7,748; sign. = 0,005

The data show that the most static units are located in area 2, while in area 1 dynamic farm are predominant. Land use system is another factor that was tested through the analysis of the relationship between geographical location and production unit typologies. In area 1 more static system are predominant, in area 2 systems inclined to change prevail (table 4):

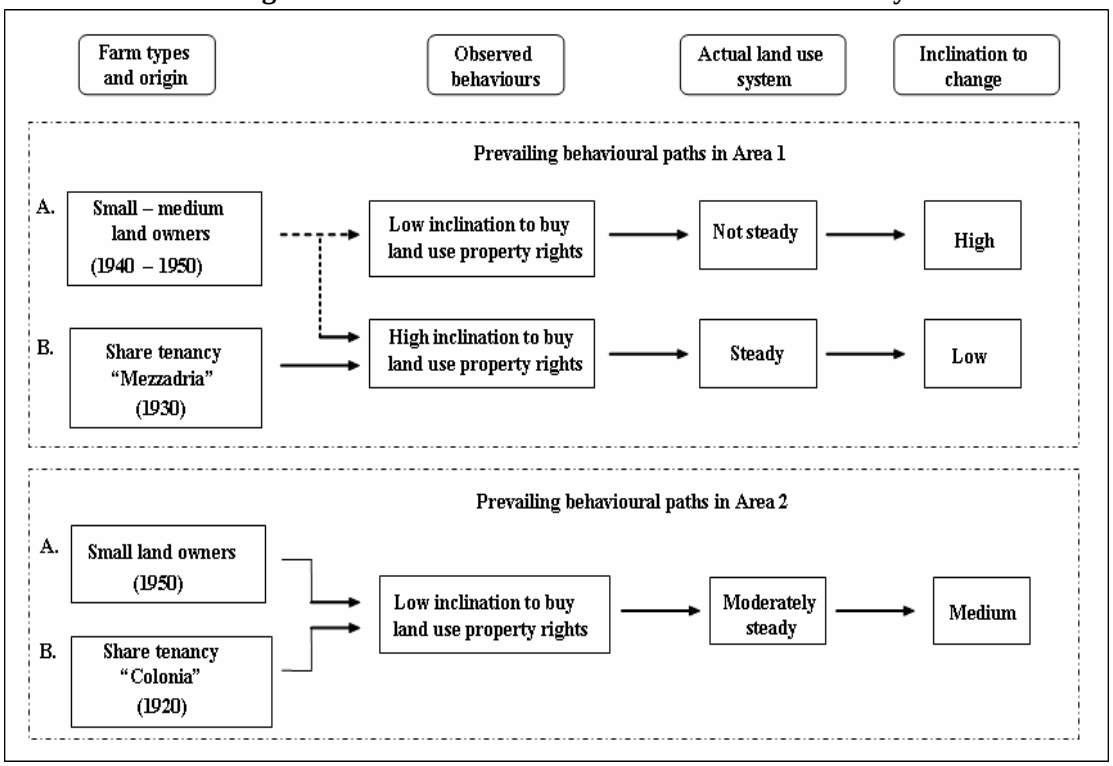
TABLE 4 Relationship between Location and Land Use System Feature

Location	Land use system feature		*Total*
	More inclined to change	Less inclined to change	
Area 1	27	44	71
Area 2	22	10	32
Total	49	54	103

a. Note: $\chi 2$ =8,347; sign. = 0,004

According to all the data it was possible to highlight some typical evolution "paths" refered either to geographical location or to behavioural strategies (figure 2).
It is therefore possible to identify a farm behavioural strategies about land ownership over the years from the origin up to now. The various "paths" can be clearly evaluated because production unit have common origin if we consider both the management system typology and the period the farms were established. A prediction of possible future change can be also made in the same way.

FIGURE 2 Prevailing Behavioural "Paths" Observed in the Two Survey Areas



4.2 Features related behaviours

The second evaluation concerned the analysis of choice behaviour at production unit level in relation to past and future choice. For this purpose two discrete choice models were built, in which the presence of a choice (past or future) was related to the variables representing the conditioning factors. These models allow the application of a linear regression in case the dependent variable should be dichotomic taking value equal to 0 or 1; for this reason thei defined a binary choice models. This evaluation model is based on the idea that the decision making unit can choose one of the two alternatives represented by modality 0 and modality 1 of the dependent variable, related to a series of features representing the model explanatory variables (or driving factors). If we know the features we can estimate an equation which enable us to predict the choices. The aim is to determine how probable it is for a certain unit to choose an option more than another. A logit model was used in this analysis on the assumption that there is a latent answer variable yi*, defined by the following relation:

(1) $$y_i^* = \beta' x_i + u_i$$

*yi** is not observable. The observable variable is represented by a dicothomic y that take the followings value:

(2) y = 1 if *yi** > 0
y = 0 elsewhere

In this model $\beta' x_i$ equals E(yi* | xi). It is possibile to stay that:

(3) $$\text{Prob}\,(y_i=1) = \text{Prob}\,(u_i > -\beta' x_i) = 1 - F(-\beta' x_i)$$

Where F is the distribution function of *u*, and xi is the independent variable vector. The functional form for F will depend on the assumption made for u_i. When it is supposed to be logistic, Logit model will come out:

(4) $$F(-\beta' x_i) = \frac{\exp(-\beta' x_i)}{1+\exp(-\beta' x_i)} = \frac{1}{1+\exp(\beta' x_i)}$$

$$1 - F(-\beta' x_i) = \frac{\exp(\beta' x_i)}{1 + \exp(\beta' x_i)}$$

The empirical model can be formalised in this way:

(5) Prob (yi = 1) = F (β'_{ST} ST + β'_{SYST} SYST + β'_{REL} REL + β'_{CONT} CONT) , i = 1, 2, …n

ST refers to the set of variables related to farm structural features, SYST the variables related to the anthropic system, REL to the exchange relationships, CONT to social and economic systems. In particular the variables referings to the anthropic system taking into account the following factors: organization structure, typology of decision making process, farmer (age, education level, activity length), family, intergenerational links, typology of family investments. The variables related to exchange relationships take in to account contracts about goods and factors and typologies of goods commercialization. Structural variables refer to farm size and typology of production planning. Finally, context variable considers farm location.

4.2.1 Past choices analysis

The first model refers to past choices, that is to say the change in the land use system made by the farmer and his/her family over the years. In the first model the dependent variable corresponds to the presence of the change occurred in time. This variable was calculated taking into account the production planning change and the changes of ownership right typology. I did not take into account the cultivation variation which did not determine a production planning change (i.e. the type of cereals, olive varieties, vine substitution, etc.). The variable referring to change in land use system (y) was defined taking into account the variables related to production planning change (y1) and changes in the composition of ownership rights (y2):

TABLE 5 Variables Used to Determine the Dependent Variable in Model I

Variable	Value	Meaning
y_1	0	Absence of change in production planning
y_1	1	Presence of change in production planning
y_2	0	Absence of change in land ownership assets
y_2	1	Presence of change in land ownership assets

The condition of change to the following expression:

(6) y = 0 if y_1 = 0 and y_2 = 0
y = 1 elsewhere

Table 6 reports the definition of the dependent variable of the first model:

TABLE 6 Dependent Variable in Model I

Variable	Value	Meaning
y	0	Absence of change in land use system
y	1	Presence of change in land use system

I considered a change of ownership rights not only the purchase, the sail or the lease of new land plots, but also the change from lease to ownership inside the family occurred after the starting of the activity. In this case the change does not refer to a possible explanation or diminution of land surfaces but to ownership typology. This choice was made considering the logic scheme of the theoretical model which highlighted the importance of evaluating how the ownership right are transferred from a generation to another. The model also evaluated the inclination to change of a system according to the presence of steady and enduring rights (a different importance was therefore given to lease or ownership). Only some of the variables resulted significant. Table 7 shows the model that best describes the probability that a change in the land use system occurred in a certain unit in the past.

TABLE 7 Model I
Number of correct previsions = 72%
Log-Likelihood = -45,26

Variable	Coef.	t-statistic	Meaning
C	2,515	1,92	Intercept
YEARACT*	-0,074	-2,84	Activity length
PRSUCCES**	1,919	1,66	Presence of successor
PARDEC**	1,863	1,95	Participative decision process
ALTINVEST*	-1,410	-2,33	Presence of alternative investment
CERFOR**	-0,058	-1,98	Presence of cereal-forage cultivation
WORKDTOT***	-0,003	-1,51	Work days per year
SUCTYP*	0,206	2,61	Succession typology

a. * = sign. 1%; b.** = sign. 5-10%; c.*** = sign. 12%

The results give interesting information on the features of the production unit that proved inclined to change. The first group of variables referring to the anthropic system resulted significant. They are partially linked to the family life-cycle as they take into account how long the farmer has been working on the farm, how old he or she is, how he or she succeeded the previous farmer (in 97% of the cases it was one of the parents), if the farm future perspectives are positive because there is a possible successor within the family and if the decision-making process is cooperative.
The variable referring to the years of activity (YEARACT) shows an inverse relationship with the presence of changes: this means that the longer the farmer has been on a farm the fewer changes occurred. To give a correct interpretation of this datum it was necessary to analyse the production unit typologies where the same farmer had been working for many years and the way the sample was modified in relation to this feature. The farmers that started working between the mid 60s and the early 70s are the ones whose production units resulted not much inclined to change because of the different way they started their activity and they were transferred the land ownership or the rent contract inside the family. In this case the transfer of management responsibilities coincided the ownership rights on all the family land plots. In the case of younger farmers that started their activity in the 80s or 90s only a transfer of responsibility took face as they started cooperating with their parents but without a transfer of ownership rights. This result, therefore, shows that the way ownership is transferred inside the family has changed over years. The reasons of this change are to be ascribed to social and cultural changes occurred in the two survey areas.
In the past the succession in the farm management was fixed together with the distribution of the estate and if there were more children working on the farm the land was divided. Later on changes occurred for two main reasons: over the years has been a significant decrease in the number of children and in the number of people willing to carry on their parents' activity. The most widespread system resulted from the survey is the increase of the cases in which a parent rents the farm to the child who carries his/her activity on, grants him/her the farm entitlement but does not divide estate. This datum is confirmed by the variable SUCTYP indicating if the farmer shared his/her activity with brothers or sisters and therefore is if the activity was transfer to one child or more children. A plus sign means that a sharing of ownership and responsibility among more people brings to more change. This fact is probably due to the necessity to increase the cultivated land and to change the production planning choice as a consequence of the new situation.
The variable PRSUCCES indicates the presence of a successor in the farm. The positive relationship with changes means that more probabilities to carry the activity on correspond to more stimuli to buy land and define the rights among relatives.
The variable PARDEC refers to a decision making process shared by the whole family in relation to the land use system and land purchase. A plus sign of this relationship with the changes might confirm the hypothesis presented in the theoretical model, that change choices

are shared and that sharing favour change mainly in relation to new purchases or the transformation of lease into ownership.
The second group of variables refers to production features: work-days presence of cereal and forage growing. In the estimated equation the total number of work days (WORKDTOT) show a negative sign. This indicates that it is less likely to find a change in farms with a greater intensity of work. To give a correct interpretation to this result it is necessary to analyse the typology of farm with high work intensity. They are mainly farms devoted to animal raring associated either with cereal-forage growing (area 1), or olive growing (area 2). In these farms the main investment choices regarded just the animal rearing (stable renovation, purchase of milk quotas, milking machines, cheese-labs, etc.); in this case land purchasing or modification of cultivation strategies were considered less important that animal rearing activities improvement.
This interpretation is reinforced by the datum on cereal and forage production (CERFOR) which was negative , that can be related to the lack of change in farms devoted to animal husbandry.
The last variable taken into account regards the influence of the other family investments (ALTINVEST) and precisely if a life insurance had been. The theoretical model had highlighted the importance of land as both investment and instrumental goods; in the sample no other forms of investment, like shares or state bonds, were detected, but the only quite common widespread is a life insurance. The negative relationship with the presence of change in land use system seems to confirm a trade-off between investments on land and alternative investments.

4.2.2 Intention to change

The second estimated model refers to future choices, that is to the intention to buy land in the next few years. The model estimates the relationship between the farm features and the probability the decision unit intends to purchase new land. In the second model the dependent variable is represented by yes/no answers in relation to the intention to buy ownership rights on land. The variable equals 0 when no intention was stated, in equals 1 when this intention was shown. Table 8 deals with the way in which the dependent variable of the second model was shown:

TABLE 8 Dependent variable in Model II

Variable	Value	Meaning
y	0	No intention to buy new land plots
y	1	Intention to buy new land plots

In this case the inclination to change was evaluated only in relation to one o the two components of land use system: the one referring to the asset of land ownership rights. Also in this case only some of the variables resulted significant. Table 9 reports the results:

TABLE 9 Model II
Number of correct previsions = 63%
Log-Likelihood = -56,40

Variable	Coef.	t-statistic	Meaning
C	0,223	0,47	Intercept
YEARACT *	-0,070	-3,14	Activity length
LOC*	1,832	3,21	Location in AREA 1
VINEY **	0,594	1,65	Vineyard surface
TOBAC ***	-0,596	-1,57	Tobacco surface
PRSUCCES **	-1,288	-1,77	Presence of successor

a. * = sign. 1%; b.** = sign. 5 - 10%; c.*** = sign. 10 - 15%

Also in this model activity length (YEARACT) resulted as significant as the variable indicating the presence of a successor (PRSUCCES). The negative sign of the first one indicates that the longer farmers have been carrying on the activity the less they intend to buy new land plots. This resulted was expected as it is natural that a person that is going to retir shows fewer purchase intentions.
Instead the negative results related to the presence of a successor was unexpected as it would seem obvious that a young successor were a stimulus to change. In the case of the survey farms an explanation to the resistance to change in this type of farm could be found considering that in these farms consistent changes had already been operated and that they have possibly exhausted their investment capacity. Anyway the datum confirms the intergenerational dynamics are very important in a correct analysis of family-farm behaviour in land use choices.
The probability of an intention to purchase land is closely linked to two types of production planning: tobacco and wine growing. The farms specialised in tobacco growing, located in area 1, are in a deep crisis and showed great scepticism about the possibility to modify their production activities in the perspective of a modification of the European funds support in this sector. As a consequence of the crisis there is an obvious difficulty in planning the purchase of land in the next future.
On the contrary the farms specialised in wine growing, also located in area 1, showed to be very active because of consistent general increase in this sector and improvement of some local vines; this make them more inclined to expand and purchase new land.
The last significant variable refers to the production unit location (LOC). The location in area 1 shows a positive relationship with the intention to purchase land. This datum indicates a major context difference between the two survey areas and it is closely linked to land market. As already mentioned the prices in municipalities located in area 2 are influenced by huge pressure coming from the demand of land for housing or tourist aims. The average prices are 10 times higher then area 1 and they are an obvious obstacle to any intention to purchase land.

5 CONCLUSIONS

The theoretical approach adopted in this study that analysed the agricultural production unit not as a simple production unit but as a complex system of agents, regulations and relationships, made it possible to consider land use and ownership choices as potentially interrelated through the proposed concept of land use system.
This concept allows to interpreter use and ownership modalities as an institutional structure because it is based on the rules existing inside the production unit-system.
The methodological approach has also allowed to make an empirical evaluation of a wider range of factors potentially conditioning land use and ownership choices, than the one proposed by the neoclassical approach.
The results highlighted that farm location is a very important factor to explain choice behaviours correctly as they are influenced by context (economic, social and cultural relationships involving the decision making unit). The results showed that choices behaviours are also influenced by the production unit specific history, its origin, the typology of decision making process and by family links on sharing and transfer of activities and know-how, the role of land as patrimonial and investment goods that are very important for rural family. The influence of production planning typology on past and future choices shows the link between use modalities and ownership rights choices. The planning characterised by a higher added value enable the production unit to get a positive return for the capital invested in the purchase of new land plots, to look positively at the whole farm life cycle and to the employment opportunities it offers to the family.
Besides, the results show that spontaneous farm reorganization is hardly predictable in areas in which there is a high pressure of the real estate market on behalf of non-agricultural operators while in areas less influenced by this pressure limits to farm expansion are represented by lack of job alternatives, income integration and by a lower profitability of agricultural activities. It is therefore necessary to plan intervention ore focused on land

market reform on a regional basis; these interventions should be put into practise considering the different economic-institutional environments of the region and the complex range of factors influencing farm activities as that these factors can be a restraint to the intervention efficiency and effectiveness.

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