POST-COMMUNIST AGRICULTURAL TRANSFORMATION AND THE ROLE

OF HUMAN CAPITAL: EVIDENCE FROM ROMANIA

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Abstract

Farm restructuring in post-communist transition countries has resulted in a broad range of farm types, such as cooperatives, companies, partnerships and sole proprietorships. This study examines which factors affect production organization choices of rural households with an emphasis on the role of human capital in the agricultural transition process. We use a multinomial logit model and data from a nation-wide survey of Romanian farms, organized in 1996. The results of the empirical tests support the main hypothesis that the transformation process outcome depends primarily on human capital and farm physical capital endowments of the household, translated into household income by the household entrepreneurial input. Entrepreneurial ability is influenced by a broad range of factors such as age, education, experience, and regional social and economic conditions.

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1   Introduction

In most communist countries agricultural production was organized in large-scale collective and state farms. Economic reforms involved both the privatization of agricultural production assets and the restructuring of state and collective farms. Farm restructuring has resulted in a broad range of farm types, such as cooperatives, limited liability and joint stock companies, limited and unlimited partnerships, and sole proprietorships. A combination of farm types can be found in most transition countries, but their relative importance differs considerably across the region (Swinnen et al.).

The incentive to apply a particular production organization is determined by the trade-off between the advantages and disadvantages characterizing each of the farm types. For example, advantages of individual farming include lower transaction costs associated with the monitoring of labor and reduced inefficiencies due to the right of co-determination. Potential disadvantages include the loss of economies of scale in risk management, input purchasing, marketing, and production. Further, there are "exit costs" for co-operative members to leave the collective farm, and "entry costs" to start up an individual farm. These costs are affected by land reform, privatization and transformation regulations (Mathijs and Swinnen).

While the role of human capital in this process has been mentioned, no studies formally modeled or empirically estimated its impact in the agricultural transformation process. In the general development literature, the role of human capital is emphasized in the

"agricultural ladder" hypothesis (Eswaran and Kotwal; Higgs; Rao). At the bottom of the ladder, individuals with a low level of human capital are employed as landless hired workers. The next step up the ladder involves cultivating some land either individually under a sharecropping contract or in some form of association. For this, individuals need to have a higher level of both entrepreneurial ability and capital. The ladder's top rang is the owner-operator.

This framework is useful for understanding the post-communist transition process. New landowners face the choice of managing their land and acting as entrepreneurs, leasing their land (and labor) to other farms, or looking for alternative options to allocate their assets. The fact that resources are allocated into different production organizations can be attributed to a strategy of maximization of utility with different asset portfolios, both in terms of quality and quantity. Households who became individual operators are expected, relative to ones choosing farming in association, to possess greater business acumen as well as conventional labor force skills and greater access to financial capital. The process is complicated by factor market imperfections characterizing transition.

This study examines the production organization choices of rural households in Romania. In section 2, the emerging farm organizations in Romania are described. In section 3, the analytical framework is presented. Data and variables used are described in section 4. The results are reported in section 5 and section 6 concludes the paper.

2   Emerging Production Organizations in Romanian Agriculture

Following the breakdown of communism in Romania, collective farms have been transformed into either "agricultural societies" (AS), "farmers associations" (FA), or individual farms. Agricultural societies are legal entities that employ both members and non-member workers and apply a co-operative type of management. Farmers associations are

smaller in size than AS and have no legal status. Land used by collective farms was partly distributed among collective farm members and partly restituted to former owners, mostly rural households.[1]   Many other collective farm assets were subject to "spontaneous privatization" when many collective farms were spontaneously broken up by their members in 1991. In contrast, privatization of state farms has been lagging behind (Jackson; Swinnen).

According to European Commission data, in 1992, around 1.5 million households, out of 5.3 million that benefited from land restitution or distribution, had decided to allocate at least part of their resources to one of the approximately 4,000 ASs or 11,500 FAs. ASs and FAs not only provided employment for rural workers and cultivated the land but also provided member benefits under the form of joint transactions with up- and downstream companies (banks, input suppliers, etc.). By 1997 more than three and a half million individual farms with an average size of 2.33 hectares dominated Romanian agriculture, occupying 58.6 % of total agricultural land (TAL). The number of agricultural societies had fallen to 3,875. They had an average size of 451 hectares and occupied 11.8 % of TAL. Farmers associations increased in number up to 12,089 in 1997. They were smaller compared to AS (on average 103 hectares) and occupied 8.4 % of TAL. Finally, 490 "commercial companies" which were mostly transformed state farms, had an average size of 3,657 hectares and occupied 12 % of TAL.

Data from a 1996 countrywide, statistically representative, farm household survey further show that by 1996, the majority of rural households were engaged in some form of individual farming (MAF et al.). Using a classification based on both land and labor allocation we distinguish five types of organization: full-time individual farmers, part-time

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[1] The individualized property rights on land are, however, incomplete. While land in most categories can be leased or sold, co-owners, neighbors and local authorities have the first right to purchase. Transactions involving a legal person require approval of the Ministry of Agriculture and Food and the Ministry of Environment. Additionally, changes in land use require prior approval of the authorities and if agricultural land is left fallow (uncultivated) for two years, the authorities have the right to expropriate such land.

individual farmers, "hybrid farmers", households farming only in association, and absentee landowners (see table 1).[2] Households which have allocated all their land in an individual farm and where more than 50% of the household members in working age are involved full-time in farming are defined as "full-time individual farmers". They represent 53.2% of the total number of farm households. "Part-time farming households" which use all their land themselves, but where less than half of their members in working age are employed in agriculture represent 13.9%. "Hybrid farmers" are defined as farm households that are full-time employed in agriculture, but which have allocated a part of their assets to co-operative farms and retained the remainder in their own individual farm. These "hybrid farmers" are a phenomenon specific not only for Romania. They represent 14.7% of the total number of rural households in the sample. The group of farm households that have allocated all their land in co-operative farms and do not carry any individual farming on, but are employed full-time in agriculture consists of 15.5%. Finally, there is a small share of rural households that are not employed in agriculture and lease their entire land out to farmers. These are, for example, industry and public services wage employees or old pensioners. They form the group of "absentee landowners" and make up for the reminder of 2.7%.

- Insert Table 1 about here –

3　Analytical Framework - Entrepreneurial Ability and Self-Selection

Human capital determines the entrepreneurial ability of farm households. The market for entrepreneurial ability in agricultural production is imperfect due to two fundamental information problems. First, human capital, and thus entrepreneurial ability, varies widely across potential individual farmers, but cannot be judged *ex ante* (Johannisson and Senneseth;

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[2] See the chart in Appendix 1 for details on the classification.

Knight). Second, due to the high nature dependence of agricultural production, it is very difficult to measure entrepreneurial input *ex post* (Allen and Lueck; Binswanger and Rozenzweig; Feder). As a result, Akerlof's "lemon dilemma" applies to the market for entrepreneurial ability in agricultural production.

Farm households with insufficient human capital relative to their other resource endowment (land and other physical assets) will face a choice of either hiring in labor or selling or leasing the surplus of the physical resources they possess. The third option, typical for transitional agricultural sectors, is to pool assets through the participation in an association (Rizov, Mathijs and Swinnen).

The choice between association and individual farming is depicted in figure 1, which graphs the income from different sources, Y, as a function of human capital or entrepreneurial ability, e. Income from association farming, Y^A, is assumed to be independent of e, while income from individual farming, Y^I, is assumed to be a concave function of e.[3] Y^A and Y^I intersect at a human capital level e^*. *Ceteris paribus*, households with $e<e^*$ will choose to farm in association. Households with $e>e^*$ will farm individually.

- Insert Figure 1 about here -

However, households can also choose for a hybrid option, that is to combine these two organizational forms by allocating part of the assets to each. The household retains a proportion of its land and other resource endowment within an individual farm unit, up to the level matching the household's entrepreneurial endowment. The remainder of the physical resources (e.g. land) is then allocated to an association. Such an organizational form will

provide, besides the income from farming individually, the uniform income from production in an association.[4] Figure 2 is similar to figure 1 and contains additionally the function Y^H showing the income achieved under the hybrid form of production organization.

- Insert Figure 2 about here -

This framework is very similar to Williamson's approach to the choices between markets and hierarchies with the possibility of hybrid forms. Associations can be considered as hierarchies, while individual farming relies on the market. Transaction costs due to imperfect markets determine which governance form households will select. Different organizational forms of agricultural production thus serve a useful role in solving the information asymmetry problem and in facilitating adjusting the initial resource endowment of rural households in the most efficient way.

In the next sections, we will analyze in more detail the choices available to a household that has obtained land and other farm assets during the agricultural transformation process. Households are assumed to maximize their total income from the resources they own in choosing between individual farm operation, leasing out to other farms, or farming in association. Additionally to these three options, other combinations of activities such as farming part-time and farming partly individually and partly in association (hybrid farming) are observed.

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[3] We ignore the fact that there may be some incentive for the members of an association to apply their entrepreneurial ability as they could claim indirectly some profit from this application, through their membership share or special benefits.

4   Methodology and Data

To analyze household choices, we follow the approach of Domenicich and McFadden, where the differences across options follow a logistic distribution function, with the multinomial logit model as the appropriate technique for estimating determinants of the rural household choices.

Consider the outcomes 1, 2, 3, ..., m recorded in the dependent variable Z, and the vector of explanatory variables, X. In our case there are $m=5$ outcomes, i.e. "leasing out", "joining an association", "farming individually", "part-time farming", and "hybrid form of farming". The values of Z are then said to be "unordered". In the multinomial logit model, a set of coefficients $\beta^{(1)}$, $\beta^{(2)}$, ..., $\beta^{(5)}$ corresponding to each outcome category is estimated:

$$\Pr(Z=1) = \frac{e^{X\beta^{(1)}}}{e^{X\beta^{(1)}} + e^{X\beta^{(2)}} + ... + e^{X\beta^{(5)}}},$$

$$\Pr(Z=2) = \frac{e^{X\beta^{(2)}}}{e^{X\beta^{(1)}} + e^{X\beta^{(2)}} + ... + e^{X\beta^{(5)}}},$$

$$...........$$

$$\Pr(Z=5) = \frac{e^{X\beta^{(5)}}}{e^{X\beta^{(1)}} + e^{X\beta^{(2)}} + ... + e^{X\beta^{(5)}}}.$$

(1)

The model, however, is unidentified in the sense that there is more than one solution to $\beta^{(1)}$, $\beta^{(2)}$, ..., $\beta^{(5)}$ that leads to the same probabilities for $Z=1$, $Z=2$, ..., $Z=5$. To identify the model, one of $\beta^{(1)}$, $\beta^{(2)}$, ..., $\beta^{(5)}$ is arbitrary set to 0 - it does not matter which. That is, if we arbitrarily set $\beta^{(1)}=0$, the remaining coefficients $\beta^{(2)}$, ..., $\beta^{(5)}$ would measure the change relative to the $Z=1$ group.   The coefficients will differ because they have different

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[4] The benefits from allocating assets to an association will commonly also include some spillovers such as better access to inputs and services, and more efficient cooping with the asset specificities. These will result in improved profitability of the individual farming operation.

interpretations, but the predicted probabilities for $Z=1, 2, ..., 5$ would still be the same. Setting $\beta^{(1)}=0$, the equations (1) become:

$$\Pr(Z = 1) = \frac{1}{1 + e^{X\beta^{(2)}} + ... + e^{X\beta^{(5)}}},$$

$$\Pr(Z = 2) = \frac{e^{X\beta^{(2)}}}{1 + e^{X\beta^{(2)}} + ... + e^{X\beta^{(5)}}}, \qquad (2)$$

$$.................$$

$$\Pr(Z = 5) = \frac{e^{X\beta^{(5)}}}{1 + e^{X\beta^{(2)}} + ... + e^{X\beta^{(5)}}}.$$

The relative probability of $Z=2$ to the base category is:

$$\frac{\Pr(Z = 2)}{\Pr(Z = 1)} = e^{X\beta^{(2)}}. \qquad (3)$$

Call this ratio the relative likelihood and assume that X and $\beta_k^{(2)}$ are vectors equal to $(x_1, x_2, ..., x_k)$ and $(\beta_1^{(2)}, \beta_2^{(2)}, ..., \beta_k^{(2)})'$, respectively. The ratio of relative likelihood for one-unit change in x_i is then:

$$\frac{e^{\beta_1^{(2)}x_1 + ... + \beta_i^{(2)}(x_i + 1) + ... + \beta_k^{(2)}x_k}}{e^{\beta_1^{(2)}x_1 + ... + \beta_i^{(2)}x_i + ... + \beta_k^{(2)}x_k}} = e^{\beta_i^{(2)}}. \qquad (4)$$

Thus, the exponentiated value of a coefficient is the relative likelihood ratio for one unit change in the corresponding variable. Relative likelihood is measured as the likelihood of the category considered relative to the base category.

We use data from a nation-wide survey of Romanian farms, organized in 1996 by the Romanian Ministry of Agriculture and Food, the World Bank, and co-sponsored by the

European Union (MAF et al.). The sample is comprised of 1,650 randomly selected rural households located in 120 communes, in turn randomly selected from a commune list. Households with holdings under 0.5 ha were excluded from the survey. The sampling was carried out in two stages with stratification in the first stage. Sample strata were a function of the agricultural profile of the commune and the development level of the county (judets) in which the communes were located. Due to missing values for some of the variables, the number of observations retained for the analysis is 1,394. The means and standard deviations of the variables used are reported in table 2.

The dependent variable (ORG) reflects the organization choice of the farm households. It is discrete with five categories representing the options of each household as illustrated in appendix 1. These are: joining an association (ASSOC_FA), leasing out/absentees (ABSENTEE), full-time individual farming (FULTM_FA), part-time individual farming (PARTM_FA), and hybrid form of farming (HYBRD_FA). We used three sets of explanatory variables: human capital variables, physical capital variables and variables concerning the socio-economic environment.

Human Capital Variables

Measuring human capital or entrepreneurial ability is difficult (Fafchamps and Quisumbing; Wydick). In this paper we only consider the human capital of the household head. The following variables were used as proxies of human capital:

Age. – An individual's age may be negatively correlated with his/her attitudes toward risk and toward the various nonpecuniary aspects of being an individual farmer. In addition, age is positively related to the individual's years of labor market experience and, hence, human capital. The age of the household head (AGEHH) as main decision-maker was included. To allow for nonlinearities, we included a quadratic term in age (AGEHH2) as well.

Education. - Education is expected to have a positive impact on the ability of an individual to start up a business in general. At the same time, however, higher education may imply higher opportunity cost of labor of a person as wage earner thus making off-farm occupations relatively more attractive. This hypothesis is tested by including the years of schooling of the household head (EDUHH) in the regression.[5] For carrying on a business such as individual farming, however, the specialized education is very important. An individual with relevant education is more likely to also have gathered appropriate experience. Therefore, a dummy variable AGREDU, equal to 1 if specialized agricultural education is possessed and 0 otherwise, was included in the analyzes.

Experience. – The experience of the household head - or the lack of experience - is expected to have an important influence on the choice of mode. To capture the effect of experience, we introduced two dummy variables. The first, MIGRATE, equals one if the household head has migrated from a town to a village after 1989, the beginning of the reforms, and is expected to have a negative impact on individual farming as it suggests a lack of experience within agriculture. The second, COMMUTE, equals one if the household head has been commuting for work to a town but otherwise residing in a village, before 1989. We expect that people working in a town, while living in a rural area would have more diverse experience and connections (social capital), and hence relatively higher entrepreneurial ability.

Adult members. - The number of household members in working age, i.e. between 15 and 65 years (ADULTS), was included to describe the household labor supply potential. The relation with the individual farming mode is expected to be positive, as more labor available

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[5] All tests of specifications including the quadratic term of education (EDUHH2) showed no nonlinearities in this variable effect.

within the household will imply more opportunity for carrying on and expanding an individual farming operation.

Physical Capital Variables

Owning assets has an important impact on individual's decisions what organizational mode he/she will choose. First, the ownership of assets secures the access and their use on the farm when markets for these assets are still missing or ill functioning.   Second, farm assets can be used as collateral for loans and thus soften the liquidity constraint. We used the following variables in the regression:

Land. - The size of the land owned by the household (OWNLAND) is traditionally the main agricultural asset. Availability of a larger land holding is hypothesized to have a positive impact on individual farming by relaxing liquidity constraints.   However, if the amount of land is not matched by the quantity and quality of other farm assets and farmer's managerial ability, then modes other than farming individually might be chosen.

Machinery. – Farm machinery is an important asset for every farmer and plays a crucial role in the total resource allocation decisions of the household. As a proxy for the size of owned farm machinery, we constructed a weighted index (MACHINE), which reflects the presence of six machinery and equipment items (trucks, tractors, ploughs, combines, carriages, sowing equipment). The following weights were used: truck = 1, tractor = 1, plough for tractor = 0.2, combine for cereals = 2, carriage = 0.5, sowing machine = 1. The variable thus ranges from 0 to 5.7.

Buildings. – Farm buildings are another asset important for the production process and their availability also affects household decisions. As a proxy for the size of owned farm buildings, we constructed an unweighted index for four building items (cattle stables, storage facilities, sheep shelters and multipurpose sheds), that is, BUILDS=0 if none of these items were owned and BUILDS=4 if all of these items were owned.

Tenure. - An important consideration with respect to land is the security of land tenure. It is expected that secure property rights are an important precondition to set up an individual farm, and hence a positive relation with the level of individual farming is expected. We introduced a dummy variable (TITLE) which equals one if a legal title on the farmland exists.

Socio-economic environment

The following variables, describing the environment within which the farm household exists and functions as a business, were included:

Social environment. - We included the percentage of the commune's population older than 65 years (OLDPOP) as a proxy for the quality of the social environment with respect to entrepreneurial potential and recognition. A higher proportion of old people in the area implies a less conducive environment and lower potential for market development and individual operation, respectively.

Market access. - We introduced a variable ACCESS as a measure of the imperfections and accessibility of the markets in which the households operate. It is a dummy variable that equals 1 when the distance to the nearest town market or railway station is small and 0 when it is large. We expect a positive correlation with the level of individual farming because a better access to markets will lower transaction costs for individual farm operators. A good access to markets, however, may facilitate the attractiveness of other production organization modes, particularly those involving off-farm work, as well.

5   Results

Table 3 presents the estimation results for the likelihood of choosing among the five modes and the relative importance of factors influencing the decisions. Human capital endowments generally have significant effect on the choice of production organization.

Young and well-educated individuals opt for off-farm jobs, which is reflected in the large and significant coefficients for absentee landowners and part-time individual farmers. Age does not play a significant role in the choice between association, hybrid or individual farming. However, hybrid and full-time individual farmers are somewhat better educated than association farmers. Specialized agricultural education has no significant impact on any mode. Experience matters in the choice on the association-individual farming continuum, but not in the choice of work off-farm. Individuals who commuted and who did not migrate from elsewhere are more likely to start up their individual farm. Finally, larger households are more likely to engage in individual farming and off-farm work, which confirms our expectations.

Physical capital endowments also play a significant role in the household choice of production organization, which suggests that factor markets are missing or ill functioning. Individual farmers, part-time or full-time, distinguish themselves from hybrid association farmers by owning more machinery and by having more secure land titles. Owning some buildings only matters when the households are full-time engaged in farming, either as individual or hybrid farmers. Land holdings surprisingly have no significant effect, except for hybrid farmers. This result is in agreement with the human capital effects and the thesis that the farm households endowed with physical capital in excess of their farming capability will opt for some form of association farming. It is noteworthy that association and hybrid farmers have no secure land title.

Finally, the socio-economic environment seems to have played a relatively small role in addition to the human and physical capital variables. The vicinity to a major town is important for the choice to do some off-farm work and for hybrid farming, but not for full-time individual farming. In other words, distance is not a crucial factor to start up an individual farm. The structure of the population as measured by the share of old people in

the commune, on the other hand, has a negative influence on the propensity to farm individually.

These results can be used to construct a profile for each of the production organizations, that is, the set of characteristics that typifies each organization, and the households that choose for it.[6] More specifically:

- full-time individual farmers are better educated, have more farming and general experience, bigger households, more secure land title and live in a "younger" environment;

- hybrid farmers compared to full-time individual farmers only in their more diverse experience. They own more land and buildings and live closer to an urban center. However, they seem to lack sufficient managerial ability and the tenure security to become real individual farmers;

- part-time individual farmers compare to full-time individual farmers in their higher education level, their larger endowments of labor and machinery and their more secure land titles. However, they are younger and live closer to town, which explains their off-farm occupation;

- absentee landowners are better educated and have more secure land titles (like individual farmers, in general). However, they have less machinery. The fact that they are even younger and better educated than part-time farmers, explains why they are not engaged in farming at all.

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[6] The base organizational form in our analysis is the association farming. Thus the characterization of remaining four organizations is relative to this base organization.

6   Conclusion

This paper analyzes the choices faced by a rural household, that has obtained land and other farm assets during the agricultural transformation process in Romania. Survey data revealed that the three main options for using these assets were: leasing out to private enterprise, joining an association, farming individually and possibly leasing in some assets. Additionally, two combinations of the three main options, farming part-time and farming partly individually and partly in association (hybrid farming) were chosen by rural households.

The new owners of restituted land and farm assets have to adjust their physical resources according to their entrepreneurial input. This is so because the entrepreneurial ability of potential individual farmers cannot be traded due to asymmetric information. As a result, landowners will self-select themselves into different production organizations. Other things equal, farmers sparsely endowed with entrepreneurial ability choose farming in association, those with more entrepreneurial ability choose to contribute only a part of their land to an association thus becoming hybrid farmers, and those with even more entrepreneurial ability choose to operate individually, and if necessary and possible to hire in more resources.

The empirical analysis strongly supports the main hypothesis that production organization choice depends primarily on the human capital and physical capital endowments of the household. Entrepreneurial ability itself is influenced by a broad range of factors such as age, education, experience, regional social and economic conditions, physical asset endowment, and market structure. However, in conditions of severe capital and market access constraints, as currently prevailing in most transition economies, many individuals with sufficient managerial capability lack sufficient or suitable physical capital to start up an individual farm. The result is that potential entrepreneurs often find it difficult to secure

external finance, which prevents them from farming individually, within the socio-economic environment characterized by market imperfections. Solving these problems together with improving the human capital base in rural areas may have important long-term productivity and rural development implications.

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FIGURE 1

Production Organization Selection: Joining an Association and Farming Individually
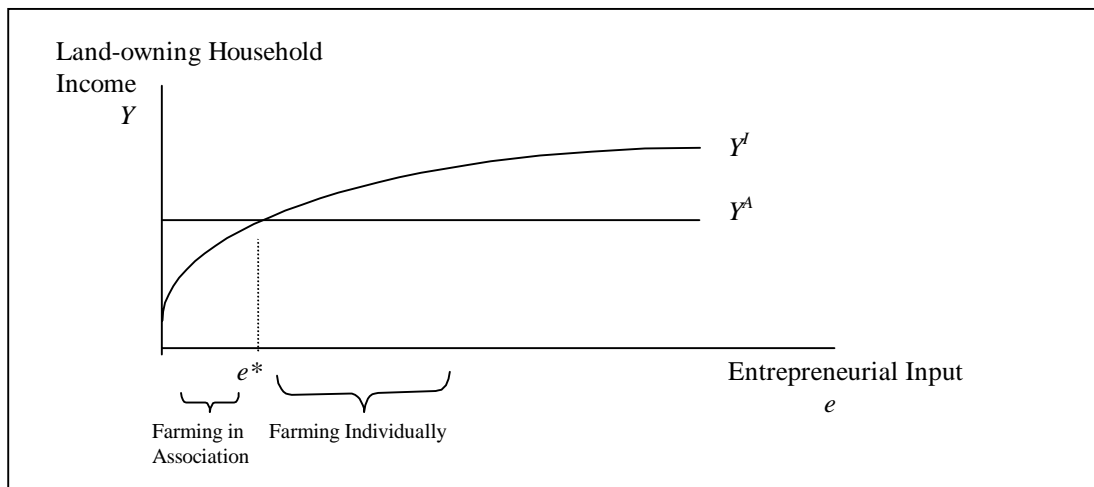

FIGURE 2

Production Organization Selection: Joining an Association, Farming Individually, and Hybrid Farming
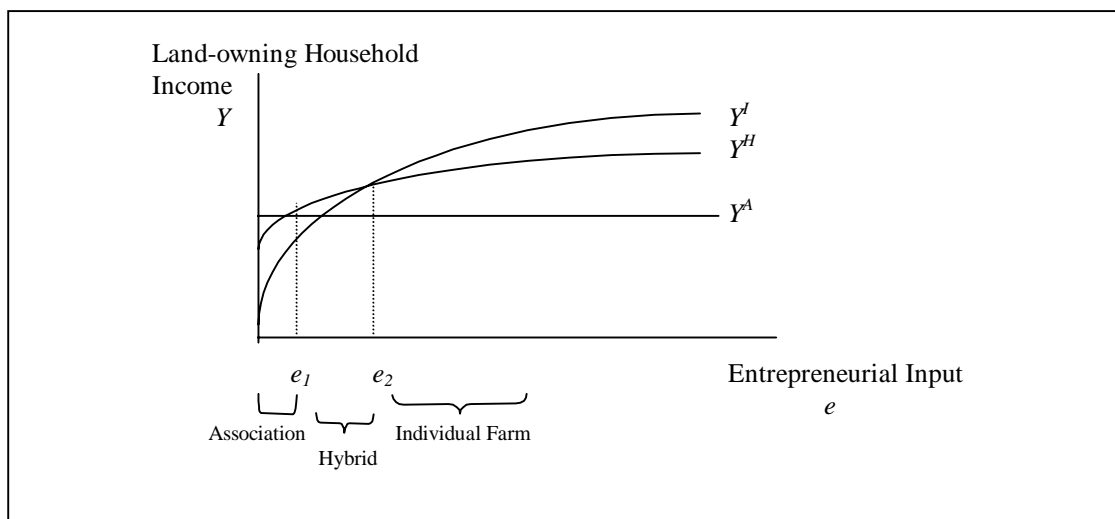
TABLE 1

Distribution of Households among Five Organizations

Org		Freq.	Percent	Cum.
assoc_fa		216	15.49	15.49
absentee		37	2.65	18.15
partm_fa		194	13.92	32.07
fultm_fa		742	53.23	85.29
hybrd_fa		205	14.71	100.00
Total		1394	100.00	

TABLE 2

Means and Standard Deviations of the Variables

Variable	Definition	Mean (Standard Deviation)
agehh	Age of household head	65.68774 (12.09069)
agehh2	Age squared x 10^{-3}	4.460953 (1.496138)
eduhh	Years of schooling of household head	6.415663 (3.323384)
agredu	Equals 1 if household head has agricultural education	.0593939 (.2364322)
commute	Equals 1 if household head has commuted to a town for work before 1989	.1578612 (.3647269)
migrate	Equals 1 if household migrated from a town after 1989	.0458307 (.2091843)
adults	Number of household members in working age, between 15 and 65	1.741033 (1.500781)
ownland	Hectares of household own land	3.262235 (2.162866)
machine	Equivalent number of machinery owned	.3137016 (.5861701)
builds	Equivalent number of buildings owned	2.436155 (1.169982)
title	Equals 1 if household possesses legal title	.4605452 (.4986198)
access	Equals 1 if the access to markets is good	.7417504 (.4378291)
oldpop	Proportion of the population older than 65 in the commune	24.84911 (7.04003)

Note. – Number of observations is 1,650. Statistics for commute and migrate is based on 1571 observations. Statistics for the rest of the variables is based on 1394 observations.

TABLE 3

Multinomial Logit Analysis of Households' Organization Choice Probabilities

Multinomial regression

Number of obs =   1394
chi2(52)   = 331.51
Prob > chi2   = 0.0000

Log Likelihood = -1447.6878

Pseudo R2   = 0.1227

Variable	absentee (1)	partm_fa (2)	fultm_fa (3)	hybrd_fa (4)
agehh	-.2197617***	-.1730392***	.0374646	.1002731
	(.0860008)	(.0592995)	(.0524712)	(.0741103)
agehh2	1.935057***	1.703136***	-.3810221	-.8539409
	(.6923645)	(.4745847)	(.4206398)	(.5852345)
eduhh	.2014702***	.1751283***	.101651***	.063939*
	(.0594865)	(.0367982)	(.0284286)	(.0358061)
agredu	-32.67988	.0899695	.2184407	-.080884
	(73.49998)	(.4915062)	(.380928)	(.5080929)
commute	.5944594	.4248126	.6955194***	.9610594***
	(.5312974)	(.3298462)	(.2658953)	(.3084268)
migrate	-.6127748	-.0703777	-.7147192**	-.8365394
	(.8384774)	(.4552403)	(.3772732)	(.5118119)
adults	-.369973	.4014002***	.1677932**	-.1394287
	(.2146452)	(.0886908)	(.0728792)	(.0967154)
ownland	.0535918	-.0194214	-.014413	.2200775***
	(.0916259)	(.0578638)	(.0458327)	(.0513877)
machine	-2.547834**	.4986094**	.5023023**	.0530074
	(1.24851)	(.2599676)	(.2277634)	(.2742348)
builds	-.0446116	-.1604151	.1452598*	.1754942*
	(.171719)	(.1003693)	(.0791478)	(.0995934)
title	.6601853*	.591391***	.3523767**	.2085676
	(.3805802)	(.2224528)	(.1757316)	(.2219651)
access	.488546	.6341887**	-.1010381	.6041853**
	(.4489845)	(.2686133)	(.1908067)	(.2568151)
oldpop	.0017865	-.0174999	-.0309264**	.0205488
	(.0279441)	(.0164822)	(.0127211)	(.015772)
constant	2.536692	1.710927	-.2327814	-5.458346
	(2.853912)	(1.948829)	(1.706993)	(2.437875)

Note. – Figures in parentheses are standard errors. ***, ** and * denote 0.01, 0.05 and 0.10 level of significance, respectively. The outcome "assoc_fa" is the comparison group. Thus each column shows the determinants of the log of the ratio of the probability of choosing the organizations described at the top of the column to the probability of choosing "assoc_fa". Variables are defined in table 2.

APPENDIX 1
Production Modes Flow Chart

1. Land allocated to individual farming (Yes / No)?

2. Land allocated to an association (Yes / No)?

3. Land leased out (Yes / No)?

4. Household involved full time in agriculture
   (more than 50% of household members
   are engaged full time in agriculture)
   (Yes / No)?

Yes   No

Yes   No   Yes   No

Yes   No

Yes   No   Yes   No   Yes   No

Hybrid farm   Individual farm   Part time farm   Association   Absentee landlords   Residual