THE DEVELOPMENT OF A STATIC FARM-LEVEL SPATIAL MICROSIMULATION MODEL TO ANALYSE ON- AND OFF-FARM ACTIVITIES OF DUTCH FARMERS;

Presenting the research framework

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Abstract

The behaviour of individual economic agents (e.g. persons, households or firms) influences policy efficiency. At the same time, policy and changes to policy affect behaviour of economic agents. In this paper, we focus on on- and off-farm activities of Dutch farmers. The share of income gained by off-farm activities, such as a job in town, has been steadily increasing among farmers the past few years. The relationship between off-farm work and a farm's economic performance suggests that a farm household's dependence on off-farm income affects the distributional consequences of agricultural policies. In order to analyse how behaviour of farmers on a micro-level generate economic regularities on a macro-level, we describe a framework for the development of a spatial microsimulation model in this paper. The latter process will be supported by the use of Geographic Information Systems (GIS). With this model we can analyse the importance of off-farm activities in distinctive regions in the Netherlands and possible effects on the efficiency of agricultural policies. Next, we can use it to project the spatial implications of economic development and policy changes at a more disaggregated level.

Keywords: microsimulation, agriculture, economic agents, GIS

JEL-codes: O18, Q12

1. INTRODUCTION

Over the last five years there has been an increase in interest in the application of spatial microsimulation. Microsimulation (MSM) is a technique that aims at modelling the likely behaviour of either individual persons, households or individual firms, including communicative qualities along with more analytical qualities. It uses micro-data on individuals, farms or firms, so-called agents, to build large-scale data sets based on the real-life attributes of the specific agents for the purpose of studying how individual (i.e. micro) behaviours generate aggregate (i.e. macro) regularities. Or, as Holm et al. (1996) put it: "Spatial microsimulation is designed to analyse the relationships among regions and localities and to project the spatial implications of economic development and policy changes at a more disaggregated level".

In this paper, we will develop a spatial microsimulation model of Dutch farmers, focussing on on-farm and off-farm activities. The share of income gained by off-farm activities, such as a job in town, is steadily increasing among farmers. The relationship between off-farm work and a farm's economic performance suggests that a farm household's dependence on off-farm income affects the distributional consequences of agricultural policies. Conservation, research and development, extension services, and farm support programs may affect farm households differently depending on the relative importance of on-farm and off-farm income-generating activities (Fernandez-Cornejo, 2007).

For our analysis of Dutch farmers, we will use information on about 380 farm households of which 150 receive income from off-farm employment. First, we will explore which are important factors for on- and off-farm activities. The focus will be on three groups of factors: household characteristics, farm characteristics and (local) spatial characteristics. Information about household and farm characteristics is collected using questionnaires. The spatial characteristics of the farms, for instance distance to the nearest urban area, will be determined using spatially-referenced data in a Geographical Information System (GIS). Second, after applying regression analysis to determine the relevant factors, we will use them to construct a microsimulation model. We use the static-deterministic microsimulation techniques as they were applied by Ballas et al. (2005) and enhanced by Smith et al. (2007).

The newly-constructed farm-level spatial microsimulation model and the associated spatially disaggregated farm population micro-data will increase our understanding of the importance of off-farm activities in distinctive regions in the Netherlands and possible effects on the efficiency of agricultural policies.

This paper first introduces the problem at hand and elaborates on off-farm employment (Section 2). We will then discuss the technique of microsimulation modelling, its history and its application related to farms (Section 3). Next, in Section 4 we present our methodological-technical research framework and explain how the three analyses in this framework are related. Finally, we include a descriptive overview of collected data.

2. PROBLEM DEFINITION

Focus in this part is a relevant economic problem that is the cause for us to do this analysis: The relationship between off-farm work and a farm's economic performance suggests that a farm household's dependence on off-farm income affects the distributional consequences of agricultural policies. Therefore, in this paper we want to analyze which variables affect off-farm activities and then, how farms with extra off-farm income are spread over the Netherlands.

2.1 Determinants of off-farm employment

Reasons for off-farm employment

All over the world, farmers can be found who struggle for sufficient income. Although many of them would agree with the statement that farming is more than just an occupation, the uncertainty of the level of production and income each year can make it a hard way of living.

In some developing countries, the low cost of living, possibilities for self-provisioning, available housing, and social network ties have attracted dislocated urban workers and retained longer-term rural residents. A feature of (full) employment in agriculture in those areas is then underemployment and hidden unemployment (Rizov, 2005). In other regions, full employment of a farmer in agricultural activities would indicate that the firm is doing well and enough income is raised.

According to Bowler (1992), there are three pathways in which a farmer can develop. First of all, by maintaining the full-time, profitable and mainly food-producing role of a viable

agricultural enterprise; secondly by income diversification through restructuring the fixed assets of the farm household into non-agricultural activities, including off-farm employment; and thirdly, marginalisation of the farm as a profitable enterprise.

According to Alasia et al. (2008), off-farm employment can arise from different motivations. Engaging in off-farm employment can, for example, be a self-insurance mechanism for households associated with an agricultural holding to help stabilizing total household income given the inherent variability in net farm income. Next, off-farm employment may be necessary to provide sufficient income to cover family living expenses if the operator of the farm is unable to generate enough revenue to support a family. Furthermore, off-farm labour may be the primary household employment for some residents, who have chosen a rural lifestyle.

Relevant variables

According to several studies there are numerous factors that affect the farmer's household's choice to go into off-farm employment. Those factors can be divided into household, farm and spatial variables.

Table 1: Overview of relevant characteristics impacting on- and off-farm activities[i]

Variable	Studies
Household characteristics	
Education	Alasia et al. (2008), Chaplin et al. (2004), Mishra and Goodwin (1997)
Age	Alasia et al. (2008)
Number of members	
Farm attachment (i.e. ownership)	
Income	
Farm characteristics	
Size/profitability	Alasia et al. (2008), Meert et al. (2005)
Number of workers	
Farm type (sector)	
Spatial characteristics	
Level of rurality	Chaplin et al. (2004)
Distance to nearest job concentr.	Chaplin et al. (2004)
Distance to nearest city	Chaplin et al. (2004)
Level of accessibility	Chaplin et al. (2004)
Level of regional unemployment	

Household variables

Several studies indicate that the level of education affects the choice for off-farm employment. Higher education extends the number of jobs for which a person is qualified, with usually higher salaries. Increases in marginal returns from education are higher for off-farm employment than farm work. This would imply a positive effect for education on off-farm employment, which is also found by Chaplin et al. (2004) and Alasia et al. (2008). On the other hand, a higher education also allows a farmer to better manage its enterprise and to apply for subsidies and grants. Therefore Mishra and Goodwin (1997) found a negative effect of education on off-farm employment, while Woldehanna et al. (2000) found no positive of negative effect at all. Possibly the size or potential of the farm is also important. This is also what Alasia et al. (2008) find: Compared to the average operator, the average farmer with a university degree is almost 20 percent more likely to work off-farm; however for operators of larger farms, this probability differential reduces to about 9 percent.

Also the age effect is not easy to predict. Old farmers often combine their agricultural activities with retirement pensions and they are not likely to start off-farm employment as it is more difficult to get a job at an older age. According to Alasia et al. (2008), younger farmers are more likely to take an off-farm employment but when they reach the age of 35 this probability decreases.

The number of household members is supposed to have a positive impact on the share of off-farm income because they can divide the on-farm work and some members will choose to fully work off-farm. Finally, attachment to the farm, in terms of how long the farm has been owned by the family for example, is expected to negatively affect off farm income.

Farm variables

The size of the farm (in ha, number of workers, or the turnover in case of intensive farming) is supposed to have a major impact on off-farm employment. Industrial development often demands large investments (technology, land) and is therefore only a realistic option for medium- and large-sized farms (Meert et al., 2005). Therefore, it is expected that farmers with a medium or large farm will less often be involved in off-farm employment. Finally, it is expected that the level of off-farm employment will differ between farm types, such as arable-dairy-, or horticulture farms.

Spatial variables

The level of rurality also seems to play a role: the more rural a location is, the less likely a farmer will engage in off-farm activities, mainly due to travel costs. Following this line of reasoning, we can also include distance to the nearest concentration of jobs and distance to the nearest city as related variables that probably have an impact on the share of off-farm activity. Further, Chaplin et al. (2004) find that public transport, as a measure of accessibility, in countries as Poland and Hungary has a positive effect on off-farm employment.

Finally, the level of regional unemployment might be in some way related to the share of off-farm income in a region.

3. MICROSIMULATION

Microsimulation is a technique that aims at modelling the likely behaviour of individual persons, households, or individual firms, combining communicative qualities together with more analytical qualities. In simulation modelling, the analyst is interested in information relating to the joint distribution of attributes over a population (Clarke and Holm, 1987). In these models, agents represent members of a population for the purpose of studying how individual (i.e. micro-) behaviour generates aggregate (i.e. macro-) regularities from the bottom-up (see, for example, Epstein, 1999). This results in a natural instrument to anticipate trends in the environment by means of monitoring and early warning, as well as to predict and value the short-term and long-term consequences of implementing certain policy measures (Saarloos, 2006). The simulations can be helpful in showing (a bandwidth of) spatial dynamics, especially if linked to Geographical Information Systems.

Microsimulation models can generally be divided into two classes: static and dynamic (Merz, 1991). They differ insofar as the response of the micro-data unit in a dynamic model evolves with time due to response changes at earlier time points, whereas in a static model the distribution of the response remains fixed. Spatial microsimulation models link individuals, households or firms to a specific location. They can be used to explore spatial relationships and to analyse the spatial implications of policy scenarios (Ballas et al., 2006). The development of spatial microsimulation studies over the last ten years is characterized by an increasing number of application fields. In particular, the publication of large public sample data sets allowed researchers to apply spatial microsimulation modelling to various socio-economic subjects.

3.1 Short history of MSM

MSM started with the pioneering work of Guy Orcutt and his colleagues (see, for example, Orcutt, 1957). Within the economics community, he advocated a shift from a traditional focus on sectors of the economy (as Leontief did with his input-output models) to individual decision-making units; Leontief, 1951). His main aim was to identify and represent individual actors in the economic system and their changing behaviour over time (Clarke and Holm, 1987). Orcutt (1957) developed an MSM system because he observed that models at that time were not able to predict the effects of governmental policy actions. Neither were they able to predict distributions of individuals, households, or firms in single or multi-variate classifications, because the models were not built in terms of such units. He argued that, if certain (simple) relationships are linear, it is relatively easy to aggregate them. But, to aggregate relationships about decision-making units into comprehensible relationships between large aggregated units, such as the household sector, is almost impossible. Therefore, his aim was to develop a new type of model of a socio-economic system designed to capitalize on the growing knowledge about decision-making units (DMUs) (Orcutt, 1957: 117). Most important is the key role played by actual DMUs, such as an individual, household, or firm.

Today, MSM can be seen as a modelling technique that operates at the level of individual units such as persons, households, vehicles, or firms. Usually, these units do not interact, although in some (dynamic) models individuals can interact, for example by getting married. Within the model, each unit is represented by a record containing a unique identifier and a set of associated attributes. A set of rules (transition probabilities) is then applied to these units leading to simulated changes in state and behaviour (Clarke, 1996).

3.2 Farm microsimulation

Most MSM tools deal with households as decision making units. They are often used to investigate the impacts of fiscal and demographic changes on social equity or to simulate traffic flows over a street network. One of the very first was DYNASIM (later followed by DYNASIM 2). This is a dynamic MSM, developed by, amongst others, Guy Orcutt (Orcutt et al., 1976). A major purpose of DYNASIM was to promote basic research about the impacts of demographic and economic forces on the population of the future. The government of the United States used DYNASIM extensively for analyses of Social Security policy in the late 1970s.

An important example of an MSM model focusing on farms is SMILE, which is a spatial MSM. In spatial MSMs the agents are associated with a location in geometric space. They can live, for example, in different zip-codes with different characteristics, or, in a mobility model, they can move/travel between distinct areas. SMILE analyses the impact of policy changes and economic development in rural areas in Ireland. The model simulates fertility, mortality, and migration to provide county-level population and labour force projections in order to evaluate the spatial impact of changes in society and the economy (Ballas et al., 2006). Recently, (Cullinan et al., 2006) extended the model with environmental information to create indicators of potential agri-tourism hotspots in Ireland in order to explore the potential (total demand for outdoor activities) to diversify from agriculture to agri-tourism. However, there are not many more MSMs developed that focus on farms.

4. METHODOLOGICAL-TECHNICAL DESIGN

The most important components of our proposed SIMfarm framework are the farm micropopulation, the behavioural model and the total simulated farm population (Figure 1). Together, they form SIMfarm that will give insight in off-farm employment opportunities in the Netherlands. In this section, the necessary steps will be described.

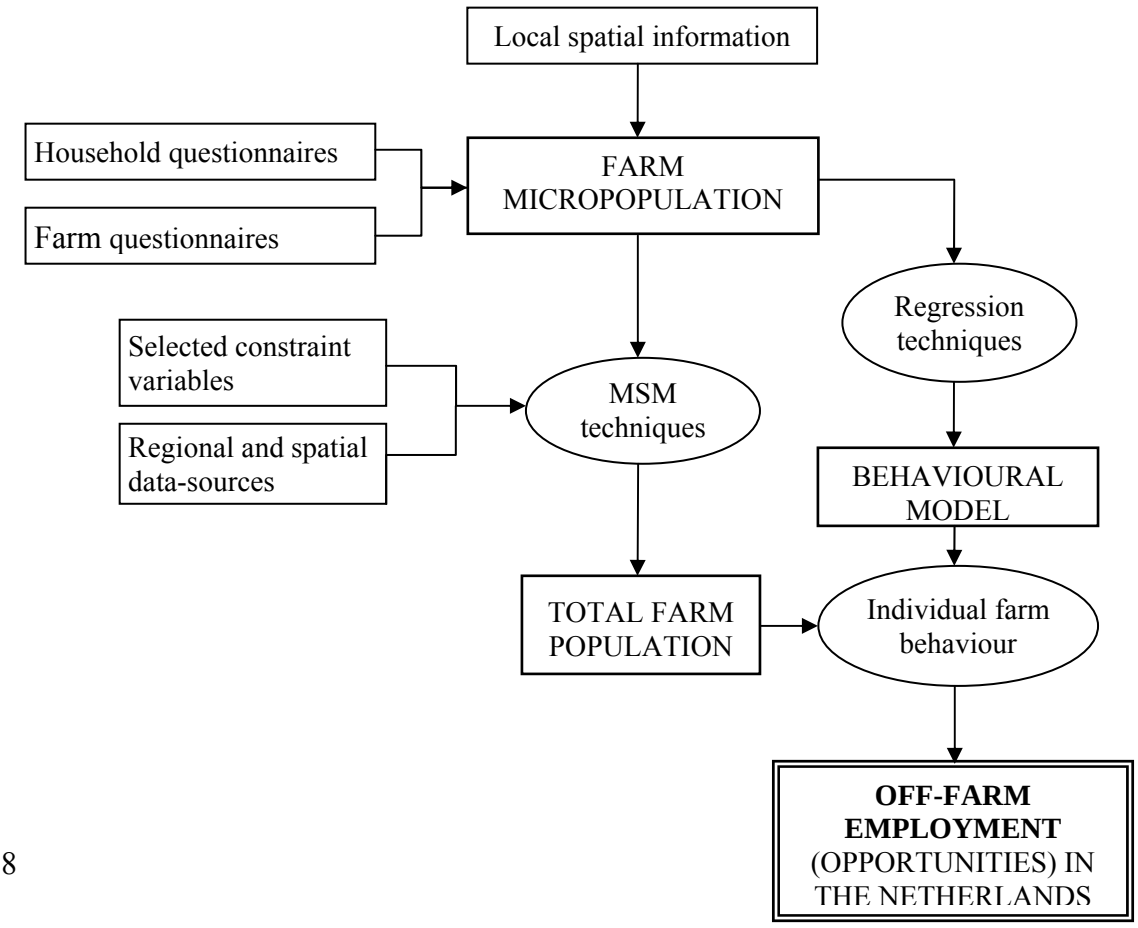

Figure 1. Schematic overview of the SIMfarm framework.

The first step of the process is to define the farm micropopulation. This is essentially a database of individual farm households containing information about the farm, the household and their location. In this database information from household questionnaires and farm questionnaires are combined, together with spatial information derived from spatially-referenced data in a Geographical Information System.

The second step is to estimate a behavioural model from the micropopulation. Firstly, through a literature review, relevant variables that affect the choice of a farm household to search for a job outside the farm are selected. Then, with help of regression techniques a behavioural model can be estimated, explaining the level of off-farm employment of farm households.

The selection of relevant variables, both by the literature review and the regression analyses, forms an important input for the microsimulation as well. To reweight the farm micropopulation to the total farm population in the Netherlands, carefully selected constraint variables are essential. Each of the constraints must be present in both the farm micropopulation and in regional and spatial data-sources at the local level. With help of proportional fitting techniques, the total farm population, including relevant characteristics will be simulated.

When both the behavioural model and the simulated total farm population are available, the most likely behaviour per farm (taking into account the characteristics of the farm, the household and of the location) can be estimated. The sum then, of all individual farms gives a picture of off-farm employment in the Netherlands.

4.1 Preparations for the spatially-explicit microsimulation model (SIMfarm)

For the development of our MSM model, called SIMfarm, we plan to use the static deterministic micro-simulation techniques applied by Ballas et al. (2005) and enhanced by Smith et al. (2007).

The deterministic method used to create the synthetic population (farm micropopulation) is a proportional fitting technique. Using this deterministic reweighting methodology, households from the questionnaires database that best fit chosen farm, household and location characteristics (e.g. farm-size, household-income, distance to a motorway ramp) from the Neighbourhood statistics (a dataset from the Central Bureau of Statistics) and from other data sources are 'cloned'[1] until the farms of each zip-code are simulated. The reliability of these

[1] Households, including all their characteristics, are copied.

synthetic populations can be validated against other census variables to ensure the synthetic population resembles the actual population (Ballas et al., 2006).

The procedure is repeated until each farm has been reweighted to reflect the probability of living in each output area. This method ensures that every farm has the opportunity to be allocated to every area. However, there may be no 'clones' of a farm in an area, or there may be six copies of a single farm. The criterion is simply how well each farm matches the constraints from the regional spatial statistics.

Constraint variables are used to fit the micro-data to the real situation/number in the zip-code areas. Each of the constraints must be present in both the base survey (micro-data set) and the small-area data set, (in our case the Neighbourhood Statistics and other data sources).

The choice which variables to use is very important as it affects the outcomes. In some models, the order of constraints in the model, as well as the number of distinguished classes, also has an effect on the results. Unfortunately, there are only a few publications dealing with these subjects (e.g. Smith et al., 2007; van Leeuwen, 2008). Furthermore, the best variables to be used as a constraint are not always available. When using small areas, the available data can be limited.

With regard to the regression techniques to be used to construct behavioural models, we plan to test several functional forms in a linear, semi-logarithmic and a double-logarithmic model, and possibly combinatory forms.

4.2 Case study selection to build the farm micropopulation

For a large part of the analyses in this paper, data derived from the European Union research project 'Marketowns'[ii] has been used. The Marketowns project, which finished in 2004, focused on the role of small and medium-sized towns as growth poles in regional economic development. For this purpose, the flow of goods, services and labour between firms, farms and households in a sample of 30 small and medium-sized towns in five EU countries has been measured, of which six in the Netherlands. The towns vary between a population of 5,000 and 20,000.

To mirror the different range of circumstances and contexts across rural Europe, in each country two towns[iii] per area typology were selected: *agricultural* areas, i.e. where employment in agriculture is well above the national average; *tourism* areas, i.e. where employment in tourism is well above the national average; and accessible *peri-urban* areas, i.e. those within daily commuting distance of a metropolitan centre. In the Netherlands, the

selected agricultural towns are Schagen and Dalfsen, the touristic towns are Bolsward and Nunspeet and the towns in urban areas are Oudewater and Gemert. As Figure 2 shows, the case-study areas are relatively equally spread over the Netherlands, only Dalfsen and Nunspeet are quite close to each other. Appendix I shows the representativeness of the Dutch towns.

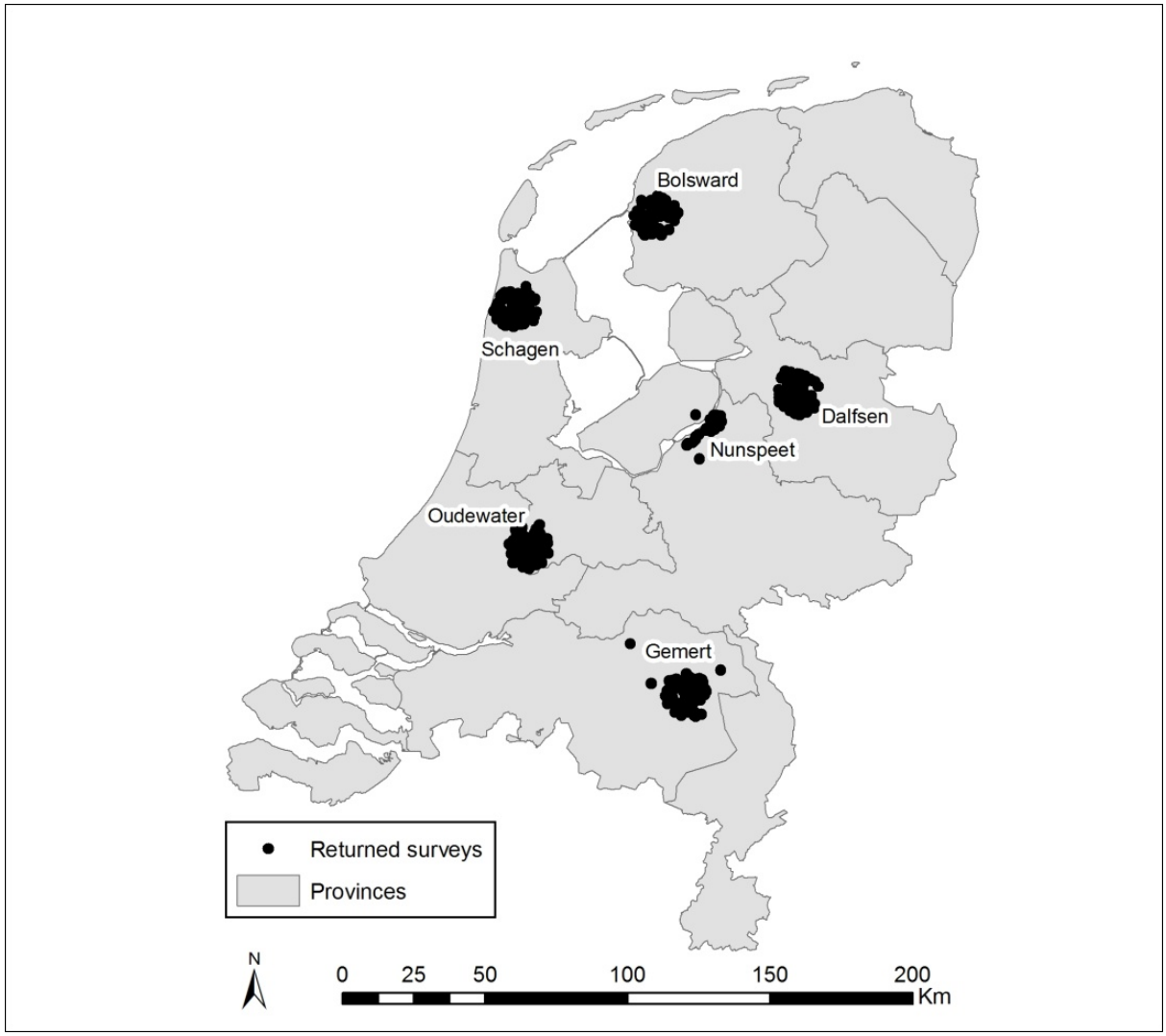

Figure 2. Location of rural study areas and returned surveys.

4.3 Data collection and preparation

In this section we describe what factors from the literature review (see Table 1) and from our own analysis of the collected data we plan to include in our initial spatial microsimulation model (Table 2).

Table 2. *Selection of characteristics for the initial spatial microsimulation model: variables (left) and operationalization (right)*

Variables	Operationalization
Structural characteristics (household and farm)	
Age farmer	Age of the farmer
Number of members	Number of agricultural household members (continuous var.)
Farm attachment (ownership)	Number of years a farm business is located on the current location
Income	Income on a scale of 1-10 (equal interval scale for Dutch pop.)
Farm type	Nine types of farms
Number of employees	First run: Total number of farm employees. Possible alternatives: Distinction between number of farm household employees and other employees; weigh employees according to full-time, part-time, or seasonal activity.
Number of vehicles	Number of motorized vehicles in possession of farm household.
Spatial characteristics	
Level of rurality	Address density data from the Central Bureau of Statistics
Distance to nearest concentration of jobs	Distance to 100,000 jobs, calculated over the road network (source: Land Use Scanner / Netherlands Bureau for Spatial Policy Analysis)
Distance to nearest city	Euclidean distance to nearest urban area
Distance to nearest motorway ramp	Euclidean distance to nearest motorway ramp
Distance to nearest railway station	Euclidean distance to nearest railway station
Level of regional unemployment	Unemployment data on local scale from the Central Bureau of Statistics

In 2003, two types of surveys were set out for the collection of both household and farm characteristics in the six Dutch rural study areas within the framework of the earlier mentioned Marketowns project. The surveys as such contained much more questions than are relevant for our specific analysis (see Appendix II for the questionnaires). Unfortunately, not all questions necessary for our research have been included in the questionnaires, meaning that for some characteristics we have to use proxy variables when we can find them.

From both households and farms, in total 455 respondents returned the surveys; the response rates for the different surveys and study areas ranging from 13 to 20 percent. In 290 of these cases (64 percent) we could link an agricultural household to its individual farm business.

Further, in these cases also the response to questions about on- and off-farm income of the household and the business questionnaire were filled out completely and matched in both surveys. These 290 cases give us a vast amount of information on both the farm business and the related household simultaneously. We will use these cases in our analysis. The response rate of surveys that are usable for our analysis thus ranges from 8 to 13 percent in the different study areas (Table 3).

For the spatial characteristics related to the survey respondents we collected various spatial datasets and made intensive use of Geographical Information Systems (GIS) to derive spatially-explicit variables for our analysis.

Table 3. Returned surveys and usable response per study area

			All surveys		Usable for our analysis	
Study area	**Sample size**		**Returned surveys**	**Response rate**	**Returned surveys**	**Response rate**
Bolsward	403	Agr. Households	67	17%	52	13%
		Farm businesses	65	16%		
Dalfsen	466	Agr. Households	94	20%	60	13%
		Farm businesses	95	20%		
Gemert	523	Agr. Households	95	18%	58	11%
		Farm businesses	98	19%		
Nunspeet	218	Agr. Households	32	15%	17	8%
		Farm businesses	28	13%		
Oudewater	482	Agr. Households	91	19%	52	11%
		Farm businesses	92	19%		
Schagen	489	Agr. Households	76	16%	51	10%
		Farm businesses	77	16%		
Total	**2,581**	**Agr. Households**	**455**	**18%**	**290**	**11%**
		Farm businesses	**455**	**18%**		

In the rest of this section we discuss the results of the surveys and spatial data preparation process for the characteristics that are relevant for our analysis. Unfortunately, the relatively low number of observations per town and the broad range of possible answers given to most questions often result in insignificant differences in mean values of variables between cases. The reader should be aware of this fact when reading the discussion of the collected data below.

Household characteristics

As mentioned earlier in Section 3, age is an important household characteristic that influences off-farm activities. When looking at the percentage distribution of all members of the households per study area (Table 4), we observe that Oudewater has the highest share of very

young children (≤7 years old), that Schagen and Nunspeet have a relatively low share or even complete lack of people aged over 64 years old. In general, it appears that the age groups ranging from 35-54 years old are the two relatively largest age groups.

Table 4. Percentage distribution of agricultural household members in age groups

Age (years) (N=289)	Bolsward	Dalfsen	Gemert	Nunspeet	Oudewater	Schagen	Total
≤7	10.2	14.2	12.0	12.9	20.8	11.2	14.1
8-12	11.8	12.8	10.1	15.7	9.9	7.8	10.9
13-16	8.6	10.2	6.3	8.6	6.6	7.3	7.8
17-24	12.4	8.4	15.4	11.4	12.3	15.1	12.4
25-34	4.8	9.3	7.2	10.0	9.4	10.6	8.4
35-44	17.2	18.1	19.2	17.1	17.0	15.6	17.4
45-54	17.2	12.8	16.8	14.3	11.8	16.8	14.8
55-64	14.0	8.4	7.7	10.0	8.0	12.8	10.0
≥65	3.8	5.8	5.3	0.0	4.2	2.8	4.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 5 shows that on average the larger households can be found in Nunspeet (4.12), Oudewater (4.08) and Dalfsen (3.83). These villages are situated in the Dutch Bible Belt. In this area, that roughly runs diagonally over the Netherlands from the southwest to the north-east, conservative protestantism is the dominant culture. In this culture it is customary to have a more than average number of children.

Unfortunately, the surveys did not include questions related to the level of education of household or farm staff members. Therefore, we can not include this variable in the analysis.

Table 5. Number of agricultural household members

	min	max	mean	std	N
Bolsward	1	6	3.58	1.377	52
Dalfsen	1	7	3.83	1.476	59
Gemert	1	7	3.66	1.606	58
Nunspeet	1	6	4.12	1.616	17
Oudewater	1	8	4.08	1.792	52
Schagen	1	6	3.51	1.475	51
Total	1	8	3.75	1.556	289

Another important household characteristic that influences off-farm activities is attachment to the farm, i.e. farm ownership. We measure this by the number of years the farm business is located at the current location (Table 6). This measure expresses attachment of a household to the farm because of, for instance, the fact that the farm business has been owned by the family for generations, or the fact that the farm has monumental value.

It appears that on average farm attachment is strongest in Oudewater (161 years), followed by Bolsward (155 years) and Nunspeet (143 years). On average a farm is situated for 122 years on its current location in the six study areas. In particular in Dalfsen farm businesses are on average younger (85 years). In Gemert and Schagen, more than 50 respectively 47 percent of the farms are located less than 40 years on their current location. This can be explained by the fact that Schagen is situated in a relatively young polder area and that in Gemert a large share of the farms are (young) pigs and poultry farms.

Table 6. Number of years a farm business is located on the current location

Ownership (years)	Bolsward	Dalfsen	Gemert	Nunspeet	Oudewater	Schagen	Total
<10	2.0	3.4	3.6	12.5	8.2	6.3	5.1
[10-20>	10.2	8.5	12.7	12.5	2.0	10.4	9.1
[20-30>	8.2	8.5	21.8	6.3	8.2	10.4	11.2
[30-40>	6.1	10.2	12.7	0.0	6.1	20.8	10.5
[40-50>	6.1	6.8	5.5	12.5	4.1	14.6	7.6
[50-75>	16.3	22.0	12.7	6.3	18.4	16.7	16.7
[75-100>	10.2	8.5	12.7	12.5	10.2	8.3	10.1
[100-150>	26.5	23.7	16.4	12.5	18.4	10.4	18.8
[150-250>	8.2	8.5	1.8	12.5	14.3	0.0	6.9
≥250	6.1	0.0	0.0	12.5	10.2	2.1	4.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Mean (years)	**155.27**	**85.32**	**99.78**	**143.24**	**161.12**	**111.10**	**122.27**
Std. Dev.	**253.18**	**129.10**	**215.04**	**236.30**	**241.06**	**231.75**	**217.65**

When focussing on household income, it appears that in Oudewater, Bolsward and Dalfsen the average income is below the Dutch average income, which is approximately € 28.000 in 2003. Also, the total average income in the six rural study areas (€ 27,200) is below the Dutch average gross annual income. However, it is not unusual that household income in rural areas is slightly lower compared to more urban areas. Only in Schagen is the average gross annual income above average (Table 7).

Furthermore, we can observe that in Gemert a noticeably high share of households has a gross annual income of at least €75,000. We can also see that in Bolsward and Oudewater there are relatively high shares of households with a gross annual income lower than € 16,000. Since the income classes used in this questionnaire are derived from an equal division of the total number of Dutch people over these ten classes, on average the distribution for all Dutch households should be 10 percent in each class. Interpreted this way, we can conclude that in general the gross annual income in the rural study areas is lower than the Dutch average.

Table 7. Percentage and absolute distribution of income

Income (x € 1,000)	Bolsward	Dalfsen	Gemert	Nunspeet	Oudewater	Schagen	Total
Class 1: ≤16	32.7	20.0	22.4	11.8	30.8	13.7	23.1
Class 2: [16-20>	11.5	5.0	8.6	0.0	11.5	3.9	7.6
Class 3: [20-25>	5.8	11.7	13.8	17.6	17.3	11.8	12.4
Class 4: [25-30>	13.5	13.3	5.2	23.5	7.7	9.8	10.7
Class 5: [30-35>	9.6	11.7	8.6	11.8	5.8	7.8	9.0
Class 6: [35-45>	7.7	20.0	15.5	11.8	5.8	13.7	12.8
Class 7: [45-55>	7.7	8.3	1.7	11.8	9.6	13.7	8.3
Class 8: [55-65>	5.8	5.0	6.9	5.9	3.8	11.8	6.6
Class 9: [65-75>	0.0	1.7	3.4	0.0	3.8	5.9	2.8
Class 10: ≥75	5.8	3.3	13.8	5.9	3.8	7.8	6.9
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Mean (Class)	**3.79**	**4.43**	**4.74**	**4.76**	**3.71**	**5.39**	**4.44**
Std. Dev.	**2.77**	**2.47**	**3.15**	**2.39**	**2.75**	**2.79**	**2.81**

Farm characteristics

Income of an agricultural household is in general related to the size of the farm and the profitability of the main activities. Therefore, it is important to include information on these latter farm characteristics in the analysis. Our database contains information on farm size in hectares. Table 8 shows that Bolsward has the highest average farm size, and also the largest farm in the sample is located here. Gemert and Nunspeet have on average the smallest farms together with the smallest maximum farm size.

Table 8. Descriptive statistics farm size (in ha)

Size (ha)	min	max	mean	std	N
Bolsward	1.0	160	42.26	25.426	52
Dalfsen	1.5	62	25.64	14.708	58
Gemert	0.8	125	17.54	19.703	55
Nunspeet	1.0	44	17.33	12.125	17
Oudewater	1.0	70	26.32	13.981	50
Schagen	1.5	133	37.89	30.612	50
Total	0.8	160	28.91	22.931	282

Of course, different types of farms have very different average sizes, so we also need to include information on farm type. The following types of agricultural activities are discerned (see Table 9). Overall, we see that grazing livestock and mixed livestock are the most important agricultural activities practised by the respondents. The latter activity is sometimes combined with cropping. Next to that, in particular study areas horticulture (Gemert and Schagen) respectively pigs/poultry (Dalfsen, Gemert and Nunspeet) are important activities.

Table 9. Percentage distribution of farms according to main agricultural activity

Farm type	Bolsward	Dalfsen	Gemert	Nunspeet	Oudewater	Schagen	Total
Arable land	1.9	0.0	6.9	5.9	0.0	11.8	4.1
Horticulture	0.0	1.7	22.4	5.9	1.9	29.4	10.7
Permanent crops	0.0	0.0	1.7	0.0	3.8	0.0	1.0
Grazing livestock	46.2	50.0	19.0	23.5	44.2	15.7	34.5
Pigs/poultry	3.8	15.0	20.7	17.6	3.8	2.0	10.0
Mixed cropping	0.0	0.0	0.0	0.0	1.9	3.9	1.0
Mixed livestock	38.5	20.0	5.2	41.2	34.6	23.5	24.8
Mixed crop. & livest.	9.6	13.3	24.1	5.9	9.6	13.7	13.8
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

The number of employees is divided into number of household members and the number of people from outside the household working on the farm. Next to that, we have information on full-time, part-time and seasonal activity for each farm employee (Table 10). As the table clearly shows, seasonal/casual work is mostly carried out by non-household members, in contrast to full-time labour.

Table 10. Percentage distribution of mean number of employees per type per study area

Number of Employees (mean)	Bolsward	Dalfsen	Gemert	Nunspeet	Oudewater	Schagen	Total
Household employees(total)	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Full-time (≥ 36 hrs/week)	*61.9*	*63.6*	*61.8*	*58.6*	*53.1*	*52.1*	*58.4*
Part-time (<36 hrs/week)	*30.5*	*33.9*	*32.5*	*37.9*	*42.7*	*25.7*	*32.7*
Seasonal/casual	*76.2*	*25.4*	*5.7*	*3.4*	*4.2*	*22.2*	*8.9*
Other employees(total)	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Full-time (≥ 36 hrs/week)	*41.2*	*0.0*	*3.8*	*20.0*	*0.0*	*5.8*	*8.6*
Part-time (<36 hrs/week)	*11.8*	*66.7*	*31.9*	*80.0*	*42.9*	*1.2*	*29.1*
Seasonal/casual	*47.1*	*31.8*	*64.3*	*0.0*	*42.9*	*93.0*	*92.4*

Spatial characteristics

First, we measure the level of rurality using address density data from the Central Bureau of Statistics. This data is available on a local scale level. Second, distance to the nearest concentration of jobs is calculated as the distance over the road network to 100,000 jobs. This data is calculated by the Spatial Planning Agency (RPB). Another job opportunity-related distance variable we use is the Euclidean distance to the nearest city. Furthermore, the level of regional unemployment is included in the analysis. This data also comes from the Central Bureau of Statistics and is available on a local scale level. Third and finally, we include

accessibility using two variables: distance to the nearest motorway ramp (based on the national road network data, NWB) and distance to the nearest railway station.

Off-farm activities

From the total 290 farm households, 44 receive income from pensions or allowances and 177 receive income from an off-farm job. Not unexpectedly, it appears that the older the farmer is, the higher the share of income from pensions or allowances. However, in this paper, we are in particular interested in off-farm employment, so the focus is on income from 'payroll employment'. From all farm households included in this analysis, 61 percent does not have an off-farm job, 15 percent receives 1-20 percent of their income from a job outside the farm, 8 per cent earns 21-40 percent of their income at an off-farm job, 8 percent 41-60 percent and another 8 percent obtains more than 61 percent off-farm. The off-farm sector in which the households are most often involved is the public administration, education and health sector. This sector is in general a very important employment sector in rural areas (see van Leeuwen, 2008). Table 11 shows that in Gemert and Schagen the level of off-farm employment is relatively low, while it is relatively high in Nunspeet and Dalfsen (which are located in the same region). Apparently, the level off-farm activities differ quite a lot between the towns.

Table 11. Percentage distribution of off-farm income classes per case-study area

Payroll employment	**n**	**0**	**1-20**	**21-40**	**41-60**	**61-80**	**81-100**	**Total**
Dalfsen	60	50,0	16,7	6,7	11,7	6,7	8,3	100,0
Schagen	51	68,6	17,6	3,9	7,8	2,0	0,0	100,0
Bolsward	52	59,6	19,2	11,5	5,8	1,9	1,9	100,0
Nunspeet	17	41,2	5,9	5,9	17,6	17,6	11,8	100,0
Oudewater	52	55,8	17,3	5,8	7,7	9,6	3,8	100,0
Gemert	58	77,6	8,6	12,1	1,7	0,0	0,0	100,0
Total	**290**	**61,0**	**15,2**	**7,9**	**7,6**	**4,8**	**3,4**	**100,0**

Table 12 shows the importance of off-farm employment for different kinds of farms. First of all, it appears that in intensive livestock farming 75 per cent of the farmers receive their income totally from farm activities. This is the highest share. In dairy farming, this share is only 56 percent, and as much as 14 per cent earns more than 61 percent of their income off-farm. Finally, Table 13, shows that, the younger the farmers, the higher the share of off-farm employment. Form the farm households of which the farmers is between 25 and 44 years old, almost half has a member with an off-farm job. For the age group of 55-64 years old this is only a quarter.

Table 12. Percentage distribution of off-farm income classes in farm types

Payroll employment	**n**	**0**	**0-20**	**21-40**	**41-60**	**61-80**	**81-100**	**Total**
Dairy farming	100	56,0	12,0	10,0	8,0	8,0	6,0	100,0
Arable farming	12	58,3	25,0	8,3	8,3	0,0	0,0	100,0
Horticulture	31	61,3	16,1	9,7	12,9	0,0	0,0	100,0
Intensive livestock farming	29	75,9	10,3	3,4	3,4	6,9	0,0	100,0
Mixed livestock	72	63,9	18,1	6,9	5,6	2,8	2,8	100,0
Mixed cropping and livestock	40	60,0	17,5	10,0	10,0	0,0	2,5	100,0
Other	6	50,0	16,7	0,0	0,0	16,7	16,7	100,0
Total	**290**	**61,0**	**15,2**	**8,3**	**7,6**	**4,5**	**3,4**	**100,0**

Table 13. Percentage distribution of off-farm income classes in age groups

Payroll employment	**0**	**0-20**	**21-40**	**41-60**	**61-80**	**81-100**	**Total**
≤25	100.0	0.0	0.0	0.0	0.0	0.0	100.0
25-34	52.9	17.6	8.8	11.8	5.9	2.9	100.0
35-44	51.0	18.8	12.5	6.3	6.3	5.2	100.0
45-54	61.6	14.0	7.0	11.6	4.7	1.2	100.0
55-64	75.0	12.5	3.6	3.6	1.8	3.6	100.0
≥65	86.7	6.7	0.0	0.0	0.0	6.7	100.0
Total	**61.1**	**15.3**	**8.0**	**7.6**	**4.5**	**3.5**	**100.0**

To get some idea about the relationship between the single variables described so far and the share of off-farm income, we performed a simple correlation analysis. Table 14 shows the results. Most of the variables appear to significantly correlate with the share of off-farm income, except the age of the farm. Older farmers and larger firms (both in hectares and expenditures) appear to be negatively correlated with off-farm income. Also a longer duration of residence of the household at the farm seems to result in less off-farm activities. Variables that positively affect off-farm employment are number of household members, level of income and number of vehicles (to drive to the off-farm job).

Table 14. Pearson correlation of share of off-farm income with a selection of household and farm characteristics

	Share of off-farm income		
Pearson correlation	Parameter	Significance	
Size of the farm (in ha)	-0.145	0.015	***
Amount of expenditures (in Euro's)	-0.131	0.030	**
Age farmer (6 classes)	-0.142	0.016	**
Age farm	-0.064	0.292	
Number of household members	0.102	0.084	*
Number of vehicles	0.112	0.055	**
Number of years living in the area	-0.097	0.100	*
Household income (10 classes)	0.104	0.076	*

Of course, this correlation is a very simple analysis. However, it gives us some insight what to expect in the next steps of our research.

5. DISCUSSION AND NEXT STEPS

The research done so far showed us that almost half of the farm households from our sample receive income from off-farm activities. From the literature we selected a list of variables that could significantly affect the choice for off-farm activities. From these first results we learned more about our dataset and it appeared that most insights from the literature also hold for our dataset. However, this is only the beginning. In the next steps of our research, it is important to simultaneously analyse the household, farm and spatial characteristics to see how they interact. Then, we can start working on the actual microsimulation and the behavioural model.

Before we take the next steps in our research, there are several points of discussion to attend:

- Do we miss any relevant variables?
- As the public sector is the most important sector for off-farm employment, should we perhaps include distance to and concentration of jobs in the public sector?
- What would be the best way to measure farm size? For certain farm types the number of hectares is a good measurement, for other perhaps the numbers of employees or the expenditures?
- What would be the best method to estimate the behaviour, or choice of the farm household related to off-farm activities?
- What could be a useful extension of the model once we simulated the Dutch farm population including relevant characteristics explaining off-farm activities and related it to a behavioural model?
- In many rural development policies, diversifying the rural economy, as well as the income of farmers is supported. Are there any specific measures important for this research?

We hope to gather information on these points by extending our literature research and by having discussions with knowledgeable fellow scientists during the 3rd Israeli-Dutch Regional Science Workshop in Jerusalem.

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REFERENCES

Alasia, A., A. Weersink, R.D. Bollman and J. Cranfield (2008). Off-farm labour decision of Canadian farm operators: Urbanization effects and rural labour market linkages. *Journal of Rural Studies*, In Press.

Ballas, D., G.P. Clarke and E. Wiemers (2006). Spatial microsimulation for rural policy analysis in Ireland: The implications of CAP reforms for the national spatial strategy. *Journal of Rural Studies* 22(3): 367-378.

Ballas, D., G.P. Clarke and E. Wiemers (2005). Building a Dynamic Spatial Microsimulation Model for Ireland. *Population, Space and Place* 11: 157-172.

Bowler, I., 1992. 'Sustainable Agriculture' as an Alternative Path of Farm Business Development. In: Bowler, I.R., Bryant, C.R. and Nellis, M.D. (Eds.), *Contemporary Rural Systems in Transition, Vol. 1: Agriculture and Environment.* CAB International, Wallingford, pp. 237–253.

Chaplin, H., S. Davidova and M. Gorton (2004). Agricultural adjustment and the diversification of farm households and corporate farms in Central Europe. *Journal of Rural Studies* 20(1): 61-77.

Clarke, G.P. (1996). Microsimulation: an introduction. In: Clarke, G.P. (Ed.), *Microsimulation for urban and regional policy analysis*. Pion, London, pp. 1-9.

Clarke, M. and E. Holm (1987). Microsimulation Methods in Spatial Anaylis and Planning. *Geografiska Annaler* 69 B(2): 145-164.

Cullinan, J.E., C. O'Donoghue and S. Hyne (2006). *Using Spatial Microsimulation Modelling Techniques and Geographic Information Systems to Estimate the Demand for Outdoor Recreation in Ireland*. Paper presented at the 8th Nordic Seminar on Microsimulation Models. Oslo, Norway, 8-9 June, 2006.

Epstein, J.M. (1999). Agent-based computational models and generative social science. *Complexity* 4(5): 41-60.

Fernandez-Cornejo, J. (2007). *Farmers Balance Off-Farm Work and Technology Adoption*. Amber Waves. FindArticles.com, 29 October, 2008.

Meert, H., G. van Huylenbroeck, T. Vernimmen, M. Bourgeois and E. van Hecke (2005). Farm household survival strategies and diversification on marginal farms. *Journal of Rural Studies* 21(1): 81-97.

Hewitt, C. (1977). Viewing Control Structures as Patterns of Passing Messages. *Artificial Intelligence* 8: 323-364.

Holm, E., Lindgren, U., Makila, K. and Malmberg, G. (1996). Simulating an entire nation. In G.P. Clarke (Ed.), *Microsimulation for Urban and Regional Policy Analysis*. Pion, London, pp. 88-116.

Leeuwen, E.S. van (2008). *Towns Today, contemporary functions of small and medium-sized towns in the rural economy*. PhD thesis, VU University, Amsterdam.

Leontief, W. (1951). *The Structure of the American Economy*. New York, Oxford University Press.

Merz, J. (1991). Microsimulation-A survey of principles, developments and applications. *International Journal of Forecasting* 7: 77-104.

Mishra, A. and B. Goodwin (1997). Farm income variability and the supply of off-farm labour. American Journal of Agricultural Economics 79 (3), 880–887.

Orcutt, G.H., S. Caldwell and R. Wertheimer II (1976). *Policy Exploration through Microanalytic Simulation*. The Urban Institute, Washington DC.

Orcutt, G. (1957). A New Type of Socio-Economic System. *The Review of Economics and Statistics* 39(2): 116-123.

Organisation, I. M. (2007). www.microsimulation.org. Retrieved October, 2008.

Rizov, M. (2005). Pull and push: individual farming in Hungary. *Food Policy* 30: 43-62.

Saarloos, D.J.M. (2006). *A Framework for a Multi-Agent Planning Support System*. PhD thesis, Eindhoven University. Eindhoven.

Smith, D.M., K. Harland and G.P. Clarke (2007). *SimHealth: estimating small area populations using deterministic spatial microsimulation in Leeds and Bradford*. Working paper 07/06, University of Leeds, Leeds.

Woldehanna, T., A.O. Lansink and J. Peerlings (2000). Off-farm work decisions on Dutch cash crop farms and the 1992 and Agenda 2000 CAP reforms. *Agricultural Economics* 22(2): 163-171.

APPENDIX I - REPRESENTATIVENESS OF DUTCH TOWNS

	Population (%)				Firms (%)		
	0-15 years	15-65 years	>65 years	4-years HH growth*	Industry	Services: commercial	Services: non-commercial
Netherlands total	19	67	14	3	18	45	31
Netherlands towns **							
Average	19	66	15	2	21	43	29
Range	13-33	58-73	7-27	-19-31	9-41	32-61	17-47
Dutch case-study towns***							
Dalfsen	21	64	14	1	22	42	33
Schagen	17	68	15	13	19	45	32
Bolsward	18	66	16	0	23	41	32
Nunspeet	21	64	15	2	24	42	28
Oudewater	21	65	14	1	23	48	25
Gemert	18	69	12	2	28	37	28

Source: CBS data.
*Growth in number of households between 2003 and 2007.
**All Dutch towns with a population between 5,000-20,000 (220 in total).
*** Only the towns have been taken into account, not the hinterland.

APPENDIX II – THE TWO SURVEYS

Some questions that are irrelevant for our research have not been (fully) included in this appendix.

Farm business survey

This survey researches the role of small and medium-sized towns in rural development and is part of a Europe-wide rural development project.

Person completing the form
1 Are you the
1) Farm owner 2) Farm manager 3) Other *please give details*

2 How old are you?
24 or below 45–54 25–34 55–64 35–44 65 or over

About the farm and its occupancy
3 What is the area of the farm?
… hectares or … acres

4 What type of farm is it?
Tick one box only.
1) Arable land 6) Mixed cropping
2) Horticulture 7) Mixed livestock
3) Permanent crops 8) Mixed cropping and livestock
4) Grazing livestock 9) Other *please give details*
5) Pigs/poultry

5 Is the farm business
1) Sole ownership
2) General partnership (V.O.F.)
3) Private Limited Company (B.V.)
4) Public Limited Company (N.V.)
5) Other please give details

6 Has the farm business always been on this location?
1) Yes, the farm business has been located here for … years
2) No, the farm business has been located here for … years

7 Was the owner or family farming before this?
1) Yes
2) No

If yes, please say where they were farming previously
Please refer to the enclosed zone map and tick one box here
A B C D E F G H

8 Does the principal farmer or farm manager live on the farm?
1) Yes → go to question 9
2) No → go to question 10

9 Have they lived here for less than 10 years?
1) Yes
2) No → go to question 11

If yes, where did they live previously?
Please refer to the enclosed zone map and tick one box here
A B C D E F G H
Now go to question 11

10 Do they live within a 7-kilometre radius of the town (zones A and B on the map)?
1) Yes
2) No

What you bought in the most recent financial year
If you cannot give exact figures, estimates are extremely valuable and much appreciated.

11 What was the approximate total value of all goods and services bought during the most recent financial year?
Exclude VAT, labour and rent. Include creditors.

What you sold in the most recent financial year
If you cannot give exact figures, estimates are extremely valuable and much appreciated.

13 What was the approximate total value of all goods and services sold during the most recent financial year?
Exclude VAT, grants and subsidies. Include debtors.

About the people employed at this address
15 In the table below the people employed in your farm business are divided into family members and other employees. For each group, state the number of persons (including yourself) and divide these into full-timers, part-timers and seasonal workers.

	Employee numbers			
	Total	Full-time (36 hours and more per week)	Part-time (less than 36 hours per week)	Seasonal and casual
Yourself and family				
All other employees				

Farm household income

17 Please provide the following information for up to 10 employees

	Employee status please tick the codes	Skills group please tick the codes	Gross annual salary or payment please enter the code	Where the person lives (see the zone map enclosed and tick below)
Employee	1. Family – ≥ 36 hrs 2. Family – <36 hrs 3. Family – seasonal 4. Other – ≥ 36 hrs 5. Other – < 36 hrs 6. Other – seasonal	1.Farmer / family worker 2. Farm manager 3. Administrator 4. Farm worker – skilled 5. Farm worker – unskilled	1. < € 16,000 2. € 16,001 - € 20,000 3. € 20,001 - € 25,000 4. € 25,001 - € 30,000 5. € 30,001 - € 35,000 6. € 35,001 - € 45,000 7. € 45,001 - € 55,000 8. € 55,001 - € 65,000 9. € 65,001 - € 75,000 10. ≥ € 75,000	1. In village 2. within 7km of village 3. between 7-16 km of village 4. Other location in the province 5. Other location in the Netherlands 6. Other location in the EU 7. Other location in the world
Yourself				
Person 2				
Person 3				
Person 4				
Person 5				
Person 6				
Person 7				
Person 8				
Person 9				
Person 10				

20 About what percentage of your annual household income is generated by the following activities?

Source activities	% of income
a) farm/agricultural business	… %
b) other on-farm please specify e.g. B&B, shooting	
b.1	… %
b.2	… %
c) off-farm please specify e.g. other businesses, work by family members	
c.1	… %
c.2	… %
	100%

21 For any off-farm income, please tell us where the activity is done

Please refer to the enclosed zone map.

Off-farm source 1 → A B C D E F G H

Off-farm source 2 → A B C D E F G H

Agricultural household survey
This survey researches the role of small and medium-sized towns in rural development and is part of a Europe-wide rural development project

About the household
1 Are you the
1) Home owner 2) Occupier 3) Other *please give details*

2 How many people live in the household?
… people

3 What are their ages?
Please tell us how many people fall into each age band
0-7 8-12 13-16 17-24 25–34 35–44 45-54 55–64 65 or over

4 How many vehicles for personal transport (i.e. car, motorbike) does the household own?
… vehicles

5 Have you lived within a 7 kilometre radius of the town (zones A and B on the map) all your life?
1) Yes
2) No, I have lived here … years

If no, in which zone did you live before (see the zones on the map)?
Please refer to the enclosed zone map and tick one box here
C D E F G H

What did your household buy the past four weeks
6 Below is a list with products. Please indicate for the past four weeks:
- How much money you spend on these products
- How often you have bought these products
- In what zone you have bought these products (see the zones on the map)

If the purchase has been done by mail, telephone, email or at the door, please indicate in what zone the company selling the product is located.
[The rather long list of products is excluded here, since we are only interested in the total amount of expenditures.]

7 Below is a list with services. Please indicate for the past four weeks:
- How much money you spend on these services
- How often you have bought these services
- In what zone you have bought these services (see the zones on the map)

If the purchase has been done by mail, telephone, email or at the door, please indicate in what zone the company providing the services is located.
[The rather long list of services is excluded here, since we are only interested in the total amount of expenditures.]

Holidays, housing costs and annual household income
8 How many euros have been spent in your household on holidays (i.e. more than two days away from home) over the past 12 months?
Please indicate the amount per zone.

9 What are the gross housing costs per month (including life insurance premium if applicable)?

None	€251 - €375	€626 - €750	€876 - €1,000	More than €1,125
€1 - €250	€376 - €500	€751 - €875	€1,001 - €1,125	

10 What is the gross annual household income?
Please include income, allowances, scholarships, and other disbursements

≤ €16,000	€25,001 - €30,000	€45,001 - €55,000	More than €75,000
€16,000 - €20,000	€30,001 - €35,000	€55,001 - €65,000	
€20,001 - €25,000	€35,001 - €45,000	€65,001 - €75,000	

Profession

11 What are your working conditions?
Please give only one answer. If you have more than one job, only give the information of your primary occupation.

1) Working full-time, … hours per week
2) Working part-time, … hours per week
3) Unemployed → go to question 13
4) Studying full-time → go to question 13
5) Retired → go to question 13
6) Disabled → go to question 13
7) Housewife, - husband → go to question 13
8) Other *please give details*

12 Can you give us more information about your paid primary occupation?

a) What is your function?
b) In what sector do you work (only one answer possible):
   1) Agriculture, fisheries, forestry
   2) Gas, electricity, water supply
   3) Industry
   4) Construction
   5) Wholesale trade and distribution
   6) Retail trade
   7) Hotel and catering industry
   8) Transport and communication
   9) Bank, financial services, insurances
   10) Government services, education, health care
   11) Real estate, other business services
   12) Culture, sports and recreation
   13) Other *please give details*

c) In what zone is the company your are working with located?
   Please refer to the enclosed zone map.
   A B C D E F G H

13 Is there an(other) adult within your household with a paid full-time or part-time job?

1) Yes
2) No → go to question 14

a) If yes, how many hours does this person work per week?
   1) Full-time, … hours per week
   2) Part-time, … hours per week

b) What is this person's function?

c) In what sector do you work (only one answer possible):

a. Agriculture, fisheries, forestry	8) Transport and communication
b. Gas, electricity, water supply	9) Bank, financial services, insurances
c. Industry	10) Government services, education, health care
d. Construction	11) Real estate, other business services
e. Wholesale trade and distribution	12) Culture, sports and recreation
f. Retail trade	13) Other *please give details*
g. Hotel and catering industry	

d) In what zone is the company you are working with located?
Please refer to the enclosed zone map.
A B C D E F G H

14 Do you have any remarks about this survey?
……..

[i] The literature reviewing process was still under way at the time of writing, so table 1 will updated later on.

[ii] The Marketowns project has been funded by the European Commission under the Fifth Framework Programme for Research and Technology Development, Contract QLRT -2000-01923. The project involves the collaboration of the University of Reading (UK), the University of Plymouth (UK), the Joint Research Unit INRA-ENESAD (France), the Agricultural Economics Research Institute LEI (The Netherlands), the Polish Academy of Sciences (Poland) and the University of Trás-os-Montes e Alto Douro (Portugal).

[iii] One small (5,000-10,000 inhabitants) and one medium-sized town (15,000-20,000 inhabitants).