



Determinants of off-farm income and its local patterns: A spatial microsimulation of Dutch farmers

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Apart from their contribution to the local economy in terms of input, output and employment, farmers also play a major role in shaping and maintaining our (natural) environment and landscapes. However, with the (planned) decrease in agricultural subsidies, these activities are at risk. For that reason, it would be useful when farmers could benefit from rural development subsidies as well. An important link between farm households and the rural economy is through income from off-farm employment.

Therefore, the aim of this research is to get more insight in how household, farm and spatial characteristics determine the share of off-farm income and how they affect spatial patterns of farmers that can benefit from it. However, this requires detailed spatial information about farm and related household characteristics. Therefore we developed SIMfarm, a novel combination of spatial microsimulation with GIS techniques, to provide the necessary information at the micro-level. The relevance of this study is that it gives a picture of off-farm income at the municipality level, based on individual behaviour in the context of the spatial situation.

SIMfarm shows that the local pattern is mainly affected by the type and scale of the agricultural activities, as well as the accessibility of jobs. The household characteristics are least distinctive for the spatial patterns. The farmers that benefit most from off-farm job opportunities are the ones close to the larger cities, as well as the ones in the regions where the farmers are younger and where they are often involved in dairy or arable farming. But, in areas where the landscape is dominated by large-scale dairy farms with little access to jobs, a low level of off-farm income can be found. However, especially the arable and dairy farms are currently receiving a relatively large amount of agriculture payments from the EU.

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1. Introduction

Engaging in off-farm employment often is a self-insurance mechanism for farm households to help to stabilize total household income (Alasia et al., 2009). In general, the level of farm household income is, apart from direct profits from farm production, influenced by farm subsidies and opportunities for other income sources on or off the farm. The importance of farm subsidies, mainly provided through the CAP, differs strongly within Europe. Although in the Netherlands the relative importance of agricultural subsidies in comparison to total output is relatively low compared to other EU-member states (5 percent compared to around 10 percent in countries such as Italy and Belgium and even over 50

percent in Ireland, Finland and Germany (Kleinhanss, 2004; Vrolijk et al., 2010)²), the share in household income can be as high as 50 percent for dairy farmers and 34 percent for arable farm households (Van Doorn et al., 2011). The likely reduction in CAP payments will result in farmers searching for other forms of stable income or leaving the agricultural sector altogether. In the United States, data from the Economic Research Service (ERS) shows that off-farm income is now the largest component of farm household income (Boisvert and Chang, 2009). In the Netherlands, evidence from a sample of 60,000 farms has indicated that between 40 and 60 percent of farm households receive income from an off-farm job (Jager and Everdingen, 2009). Furthermore, the share of income from an off-farm job has steadily increased from 5 percent in 2001 to almost 10 percent today.

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² These differences can be explained by a difference in the presence of less-favoured areas, differently-sized farms and/or different types of farms.

We observe nowadays a general renewed interest in the regional identity, which has led to an increase in consumer demand for ecological and region-specific products. In addition, an increasing demand for tourism and recreation has been particularly important in richer countries and much of this is based on new 'consumption' uses of the countryside (Bryden and Bollman, 2000). It may even be argued that the tourism industry has now become the backbone of many rural communities, having de facto replaced agriculture in this role (Garrod et al., 2006). The related economic diversification of the countryside and the associated increasing off-farm income opportunities can add to the interactions between rural development policies and agricultural policies, pointing towards additional benefits from broader rural policies for the agricultural sector (Jetté-Nantel et al., 2011).

Clearly, the ability to get a job off the farm is dependent on several factors, not only the availability and accessibility (spatial factors) of employment, but also farm and household related factors and combinations of these factors (see Matthews, 2004). This means that in some areas, certain types of farm households might benefit more from rural development subsidies than others.

From this perspective, the present paper focuses attention on the spatial distribution of off-farm income in the Netherlands, and on the factors determining this spatial pattern. As mentioned above — and explained more thoroughly in Section 2 — a wide range of factors affect the potential for an individual farm-household to obtain off-farm income. However, it is not easy to obtain information about off-farm income and its determinants at the relevant spatial level. Therefore, we use a novel combination of spatial microsimulation (MSM) with GIS techniques to provide the necessary information at the micro-level. The relevance of this study is that it gives a micro-based picture of off-farm income, not by simply scaling up, but by first simulating all individual farmers and then by aggregating their individual behaviour in the context of their spatial situation. As a case-study, we will simulate the Dutch farm population in the north of the Netherlands, while considering its relevant characteristics based on detailed household and farm questionnaires. The north of the Netherlands is an interesting case study area because this area has a relatively large number of farmers, but is distant from the concentration of jobs in the densely-populated western part of the Netherlands (known as the Randstad).

This paper first provides a theoretical framework of the determinants of off-farm income (Section 2). We then concisely discuss the technique of MSM modelling and its application related to farms (Section 3). Next, in Section 4 we present our new methodological—technical research framework and explain how the spatial MSM will be linked to a behavioural model and a GIS component. In Section 5, the behavioural model aiming at estimating the share of off-farm income is described, followed by the farm application of the new MSM model in Section 6. Finally, in Section 7 the results are discussed, followed by the conclusions in Section 8.

2. Determinants of off-farm employment

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 characteristics (see Table 1 for an overview).

2.1. Household variables

Several studies indicate that the level of education affects the choice for off-farm employment. Higher education extends the

Table 1
Overview of relevant characteristics impacting on- and off-farm activities.

Variable	Effect on off-farm activities	Studies
<i>Household characteristics</i>		
Education	+/-	Alasia et al. (2009), Chaplin et al. (2004), Mishra and Goodwin (1997)
Age	-	Alasia et al. (2009), Goodwin and Mishra (2004)
Number of family members	+	Lass et al. (1991), Goodwin and Mishra (2004)
Farm attachment (i.e. ownership)	-	Sofer (2005)
Income		Sofer (2005)
<i>Farm characteristics</i>		
Size	-	Alasia et al. (2009), Meert et al. (2005), Fernandez-Cornejo (2007), Evans and Ilbery (1993)
Ownership/tenancy	-	Boisvert and Chang (2009)
Farm type (sector)	+/-	Evans and Ilbery (1993), Boisvert and Chang (2009)
<i>Spatial characteristics</i>		
Level of rurality	-	Gardner (2001), Goodwin and Mishra (2004)
Level of accessibility/Distance to nearest job concentration	+	Chaplin et al. (2004)
Distance to nearest city	+	Chaplin et al. (2004), Lass et al. (1991), Goodwin and Mishra (2004)
Available jobs in other sectors	+	Boisvert and Chang (2009)

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 for farm work. This would imply a positive effect for education on off-farm employment, which is indeed found by Chaplin et al. (2004) and Alasia et al. (2009). On the other hand, a higher education also allows a farmer to better manage their 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 effect at all. According to Alasia et al. (2009), together with education level, the size or potential of the farm is important as well. Related to this, family income can be an important reason for engaging in off-farm employment. Sofer (2005), for example, finds that Israeli farm households with a medium income are more likely to conduct business off the farm than those with a low income.

Concerning age it appears that 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 (see also Goodwin and Mishra, 2004). According to Alasia et al. (2009), younger farmers are more likely to take an off-farm job but when they reach the age of 35 this probability decreases.

The household size is expected to have a positive impact on the share of off-farm income because a larger household can more easily divide the on-farm work and some members will choose to fully work off-farm. At the same time, the presence of children under the age of thirteen years in the household significantly reduces the supply of off-farm labour (Goodwin and Mishra, 2004). According to Lass et al. (1991) the number of children is positively associated with off-farm employment for farm men, but the association is negative for farm women. More children may imply more need for additional income but also additional child care at home. 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 (Sofer, 2005).

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