Exit from farming and land abandonment in Northern Norway

Stokstad G.

Norwegian Forest and Landscape Institute, Norway

PAPER PREPARED FOR THE 116TH EAAE SEMINAR "Spatial Dynamics in Agri-food Systems: Implications for Sustainability and Consumer Welfare".

Exit from farming and land abandonment in Northern Norway

Stokstad G.

Norwegian Forest and Landscape Institute, Norway

Abstract — T**he combination of nature and farmed land is one reason why Northern Norway is attracting tourists. It is therefore of interest to know which farms that are more likely to quit faming, and to see what factors that are important for abandonment of farm land when the owner of the farm exits farming. Our results indicate that smaller properties in areas with few farmers are the most likely to be abandoned. Property structure is another important factor for abandonment, but is less important for the exit-decision. Size of the farm, including both rented and own farm land, appears to be more important for the exit-decision. Larger farm operations, with breeding stock, primary sheep and dairy cattle are more likely to continue farming.**

Keywords— **Farm exit, abandoned land, logistic regression.**

I. INTRODUCTION

Nature is a prime reason why Northern Norway is attracting tourists. However, what makes the nature in Norway unique is the combinations of nature and farming. Between 1999 and 2006 almost one third of the active farmers in Northern Norway exited farming, and the average farm size increased from 16,4 hectares to 22,8 hectares [1]. Most of this increase is due to rented acreage that becomes available when others exit farming, but some new cultivation has also taken place. On average about 33 percent of the farmed area was rented in 1999, while it had increased to 47 percent seven years later. The average number of rental agreements per farm increased from 2,5 to an average of 4.

Northern Norway is the region of the country with the largest share of abandoned farm land if we compare the area which farmers apply for acreage support with the area of potential farm land. Aggregate figures for Northern Norway show only minor changes in total agricultural acreage. At the same time, there is a significant local land use changes as some land is abandoned and new land is cleared. One reason for this may be that farmers who quit farming themselves, on average tend to rent out less land than what they earlier applied for acreage support for. A land use study based on areal photos supports our finding that abandoned land in general is less common on properties that are in use by the owner compared to properties that have rented agricultural land [1].

Farmland in Northern Norway is primarily used for grass production with sheep and dairy/beef being the most common animals to keep. Thus, farming in this region requires that there is sufficient with livestock in the region.

Farm exits are tied to land abandonment – however the amount of abandonment varies by how much of the land that is rented out to other farmers. Active registered farms in 1999 that also was registered as renting out land in 2006, about 25 percent of the area was not rented out in 2006. While for properties that was rented out in both years, the average change in size of area was minor. This difference can be due to several reasons. Hobby farming like some horses without own winterfeed production, is one example of such a production. However, we also expect that not all areas are equally interesting to utilize by neighbouring farmers, due to for example old ditches that need maintenance or difficult access by modern farm machinery. It seems to be some loss of area in use for farming when land is rented out – however the main source of land abandonment is tied to farm that exit farming and do not rent land to other farmers.

II. OBJECTIVE

The objective with this paper is to identify factors that may lead to land abandonment. Farm exits are a prerequisite for abandonment of land. It is also likely to imply some land abandonment even though if there

is a neighbour that wants to rent more land. Thus the first issue studied is a) causes of farm exits.

Abandonment of land further depends on whether land is rented out or not to other farmers. Thus, the second issue studied is b) what causes land to be rented to other farmers.

We are studying whether the farm continues to exist as the centre of a farm operation. This differs from who runs the farm. In our sample, if the farm is sold and continues to exist as the centre of the farm operation with a new owner, is it counted as a farm that continues to exist as a farm.

Farm exits or farm succession is usually studied at one of two levels: (i) survey data of single farms within a region for example [2] or (ii) studies that look at different exit rates in various regions [3]. This makes it possible to test various hypotheses. For example, in both types of studies farm sixe and age of farmers are found to be significant factors. Studies based on survey data moreover indicate that income from tourism or other income possibilities at the farm reduce farming exits. This type of data is however not available or collected by Norwegian Agricultural Authority (SLF). As all the farms are geo-referenced, we are able to include explanatory variables that have to do with the location of the farm.

III. MATERIAL AND METHODS

Farm level data from the applications of acreage support and the support per animal in 1999 and 2006 for farms in Northern Norway are obtained from SLF. Our dataset includes almost all active farms in the region – Northern Norway. About 30 farms are excluded due to lack of data for where the farm is located each year.

Each applicant for subsidy has a number that also identifies the property. The normal situation is that an active farm is owned by the person who is farming the property. When a farmer applies for subsides for rented land, he must register the property number of this land. Therefore are we able to identify whether a farm that was an active farm in 1999, also was an active farm in 2006.

The first issue a) causes of farm exits is studying by using a logistic regression to explain which factors that increase the probability for an active farm to stop

existing as an active farm where the farmer applies for subsidies. The sample size is 6288 farms, where 35 percent exited farming between 1999 and 2006.

The registered property number enables us to determine whether a farm that stops applying for acreage support is renting out land to another farmer in 2006, or whether no one is applying for subsidies for this land. The latter situation suggests that the land is left idle. Thus, it is also possible to take a closer look at those applicants in 1999 that have exited farming in 2006. They consist of two groups, those that rent out their land in 2006 (this is the majority counting 1546 farms), and those that did not rent out their land (689 farms). Thus b) is studied by using logistic regression to identify factors that differ between these two groups. This implies that one assumes that the probability for exit or for renting land given an exit can be expressed as equation 1:

$$\Pr ob(Y_i = 1) = \frac{e^{\{\beta'X\}}}{1 + e^{\{\beta'X\}}} \qquad [1]$$

The expression β'x is a linear function, table 1 and 2 show which variables that are included as explanatory variables.

IV. EXPLANATORY VARIABLES

Potential explanatory variables are divided in four groups.

A. Area related variables

Size of the farm is often found to be a significant variable for farm exits. In this study we have used acreage owned by the farmer and the total amount of land used by the farmer. Equation b separates between land that is left idle and rented out.

B. Farmers age and farm organization

The second group we have considered is operatoers of the farm. We separate between single holder-farms and firms. The firms are mainly dairy cooperation with a few participants in addition to some schools and other institutions where farming is part of the firm's activity. However the majority of the farms in 1999

was run by single farmers. For the single farmers we know the age of the farmer in 1999.

One would expect that farms in general cease to exist when the present farmer approaches retirement age. Lack of an identified successor strengthens the age impact. We also see this tendency in the data, however all age groups are exiting farming, and it is not a constant linear relationship between exit rate and age. The group with the lowest exit rate is the middle aged farmer in 1999 (born around 1960) but exit differences are minor for the younger age groups. Thus age is accounted for by dummy variables identifying the older age groups.
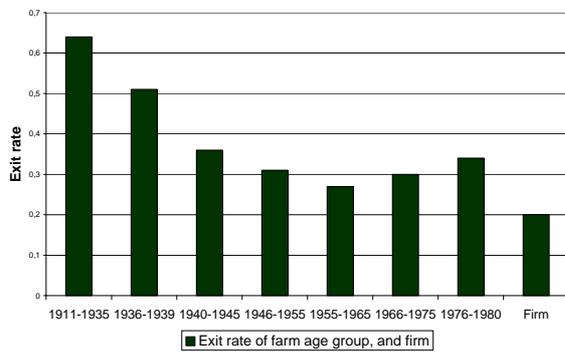

Fig. 1 Exit rate for firms and for the various age groups of single farmers.

C. Type of farming activity.

Farm type is included with dummy variables. In this region grain and vegetables are very minor productions. Grain production is not an economically interesting activity in most of the region, due to a short growing season.

Thus, farmed area is mainly used for grass production to produce pasture and winter feed for primarily dairy-cattle and sheep. However, in some regions milk production on goats is an alternative production. Milk production both from goats and dairy cows are regulated with use of milk quotas. Beef cattle was a minor production in 1999, however it has been increasing under this period. One reason for including type of production is that it is expected to be related to the investments in building and machinery on the farm. We have also used a dummy variable to identify

whether there is only a very small number of sheep on the farm. (Farms a few sheep will have "Sheep production" = 1 and "Less than 25 ewes" = 1. Thus it is the sum of these two variables that give the total impact of having only a small sheep flock. In 2003 the subsidy scheme changed, demanding a minimum amount of farm income from sale of farm products with value added tax (excluding private use) in order to be able to receive subsidies. (This was however later changed to a lower minimum value – and not tied the tax regime.) In addition. a new regulations regarding fire protection, which required a significant investments also in relatively small sheep barns, gave many farmers economic incentives to end their small sheep-faming activity at this time.

D. Location

Average exit rate increase as we move north-east – suggesting some differences between counties. Finnmark is the most northern county, and included as an explanatory variable.

Norway is divided in farming-areas with respect to landscape type and growing conditions. , Northern Norway has two coastal regions, fjord-, forest- and mountain-regions. Average farm size and share of the various farm types varies between these regions.

The last type of location variables measures how many neighbouring farms the farm has. It is based on a count of the number of other active farms within a distance of 6 km measured along public roads. This is used to create dummy variables that separate farms into groups with increasing number of neighbours.

- Remote, no neighbours within 6 km
- 1-5 neighbouring farms
- 6-13 neighbouring farms
- Central location, 14 or more farms within 6 km

V. RESULTS AND DISCUSSION

A. Causes of farm exits

Tabel 1 shows the parameter estimate from the logistic regression. A negative value implies that the factor reduces the probability for exit, while a positive value works in the opposite direction. Most of the

variables are dummy variables 1 or 0. For these factors, one can compare the relative impact of a factor by comparing the value of the estimates.

Size of the farm operation matters. Larger farm operations with respect to hectares of land are less likely to exit. It is common in Northern Norway to have a relatively large share of rented land. As the farmer owns more of the land, this reduces the likelihood that the farm will exit. However being big, is more important than owning a large share of a smaller farm, to reduce the probability for exit.

Firms are less likely to exit, than other farms. Farm with an older farmer are increasingly more likely to exit farming. Age between 50 to 55 years old in 1999 has a low parameter value and it is not significantly different from the younger group at a 5 % level. While the parameter estimate and significance level increase with older groups.

Table 1 Factors that are used to explain exit from farming, estimated values standard error and significance level of the parameter estimate.

Parameter	Estimate	Standar error	Chi-Square	Pr > ChiSq
Intercept	1,16	0,09	160,8	<.0001
a)				
Area in use, hectars	-0,07	0,01	138,8	<.0001
Area owned by the farm, hectars	-0,03	0,01	15,5	<.0001
b)				
AS or cooperation	-0,94	0,43	4,8	0,0281
64 years old and older	0,98	0,11	82,5	<.0001
60-63 years old	0,72	0,10	47,8	<.0001
54-59 years old	0,15	0,08	3,4	0,0649
c)				
Sheep production	-1,28	0,09	213,5	<.0001
Less than 25 eves	1,24	0,10	147,4	<.0001
Cows	-0,81	0,10	66,4	<.0001
Goats	-1,04	0,13	63,1	<.0001
Cows and sheep	-0,54	0,21	6,7	0,0099
d)				
Finnmark	0,21	0,12	3,0	0,0835
Forest region	0,19	0,08	6,0	0,0145
Coast of Troms and Finnmark	0,25	0,16	2,5	0,1123
No farm neighbours /Remote area	0,23	0,17	1,8	0,1802
Sentral location	-0,11	0,07	2,9	0,0878

A sheep herd of more than 24 ewes is less likely to exit, while the dummy variable for having only a small sheep herd – has the opposite sign and removes this impact of having sheep. Keeping dairy-cows and beef-cattle in addition to goats are also reducing the probability for exit compared to the farm group that produce feed primarily for sale, or have some cattle for meet production (not cows). It is fairly common to both have dairy cows and sheep. Thus, the dummy variable "both cows and sheep" where included to allow for a reduction of the total effect. However, this variable suggests that this is the group if farms that are the least likely to quit. Since the total impact of all three farm type variables is a large negative number.

There are also regional differences. As expected, farmers along the coast of Finnmark are the most likely to quit. This is the region where abandoned land is a common sight, and farms usually have few neighbours. However, also being located in the forest region of Northern Norway will increase the probability for farm exit. The average farm in the forest region in Troms and Finnmark is larger than in the other regions. This suggests that it is the relative size of the farm in the regions that matters, more than actual size. The most remotely placed farms, no neighbours and the most centrally placed farms are identified with two dummy variables. The signs are as expected, more central location means less likely to exit. However, only central location is significant on a 10 % level.

B. What causes land to be rented to other farmers?

Table 2 shows parameter estimates and significance level for the factors that help explain which farms that rent out their land when the owner of the land has stopped to farm the land himself.

A larger own area reduces the probability that the land will be abandoned. This implies that larger properties are more interesting to rent than smaller properties. However, the impact of total area (combined rented and own land) is three times as large. For farms that are out of active use by the owner, the likelihood that the land is leased out increases with the size of the property. Thus, a larger total acreage (= own plus rented area) reduces the probability that the farm land will be rented out. One

way to explain this is that if you are large, and rent most of the available land nearby, it may be few to take over your land when you exit farming. In addition farms that already rent out some of their land in 1999 have a higher probability for that land is rented out in 2006 also.

There is no obvious reason that abandoned land should be related to farmers' age in general. However, if the farmer is older than 64 years in 1999, the model predicts that less land is rented out. The reason may be that this group consist of farmers that could have retired from farming earlier, and the main reason that they still are farming in 1999 is that there is no-one that are interested in renting the land. Eventually they exit farming, for example due to health reasons or need for significant new investment in order to continue.

There are some differences between farm types on the likelihood that they exit farming and if their land is leased out. Keeping animals, with one exception – a small herd with sheep reduces the probability that the land will be left idle.

Location in relation to other farmers is a significant factor explaining whether a farm is rented out or not. The more remote, the less likely it is that the fields are taken in use by other farmers, the more central in relation to other farms, the more likely is that the land is rented out.

VI. FINAL REMARKS

Generally, productions that often are run by part time farmers with small land holdings are more likely to quit. When they stop farming their land themselves, it becomes less likely that their land is rented to others. Farmers in all age groups are ending their farming activity, even though older farmers are more likely to exit farming. As the number of neighbouring farms reduces, the likelihood that someone will rent the land decreases. However, location in relation to other farms is not that important when considering whether to continue or to exit farming. From a landscape perspective farm exits in central farming regions will have smaller consequences than in more remote areas, where it is more likely that the land is left completely idle. We also find that the existing property structure matters- areas with small holding are more likely to have increasing abandonment – than in areas where properties are larger.

Table 2 Factors that influence the probability that the land not is rented out when a farmer quit farming. Parameter estimate, standard error and significance level of the parameter estimate.

Parameter	Estimate	Standar error	Chi-Square	Pr> ChiSq
Intercept	0,47	0,137	11,6	0,0007
a)				
Area in use, hectares	-0,02	0,011	3,6	0,0564
Area owned by the farm, hectares	0,095	0,017	31,9	<.0001
Rented land	0,41	0,120	11,5	0,0007
b);				
AS or coop-eration	-1,61	0,771	4,3	0,0372
64 years old and older	-0,25	0,135	3,4	0,0671
c)				
Sheep production	0,37	0,141	7,0	0,008
Less than 25 eves	-0,90	0,145	38,7	<.0001
Cows	0,45	0,179	6,2	0,0128
Other cattle	0,60	0,247	5,8	0,016
d)				
Finnmark	-0,50	0,177	7,8	0,0051
Forest region	-0,41	0,221	3,4	0,065
Mountain regions	-1,27	0,704	3,3	0,0713
No farm neig-hbours	-1,18	0,293	16,2	<.0001
1-5 neighbours	-0,55	0,121	20,6	<.0001
Central location	0,51	0,128	16,1	<.0001

REFERENCES

1. Puschmann O, Stokstad G (2010) Status og utvikling i jodbrukslandskapet i Nordland, Troms og Finnmark. Norsk institutt for skog og landskap. Rapport 6/2010.
2. Bragg I A, Dalton T J. (2004) Factors affecting the decisions to exit dairy farming; a two stage regression analysis. Journal of Dairy Science, 87:3092-3098.
3. Breusted G, Glauben T (2007) Driving Forces Behind Exiting from Farming in Western Europe. Journal of Agriculture Economics, 58(1):115-127.

(grete.stokstad@skogoglandskap.no)