The Pattern of Austrian Dairy Farm Household Strategies

Die Struktur der landwirtschaftlichen Haushaltsstrategien österreichischer Milchviehhalter

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Abstract

Developments in the agriculture sector, such as the European Union (EU) Common Agricultural Policy reforms and the increasing volatility of the markets due to liberalisation processes, pose far-reaching challenges to farm household development, and especially the most affected sectors, such as dairy farming. It is assumed that individual farmers develop strategic approaches to their future farming activities (farm household strategies) in order to react to these developments. This involves reconsidering existing approaches and developing new strategies, both on and off the farm. In order to evaluate these developments, it is necessary to first evaluate the current pattern of farm household strategies. This paper identifies and examines the farm household strategies of Austrian dairy farmers in order to better understand farm household development. Secondary data analyses on the basis of a survey of Austrian dairy farms conducted by the Federal Institute of Agricultural Economics Vienna provided the required information for the empirical identification of various types of farm household strategy. The analyses revealed a pattern of six types of farm household strategy within Austrian dairy farms: (1) genuine specialisation, (2) concentration, (3) horizontal diversification, (4) lateral diversification, (5) stable reproduction, and (6) disengagement. The study underlines the significance of socio-economic as well as demographic and farm characteristics which were used to identify and describe types of farm household strategy.

Key Words

dairy farming; farm household strategy; professionalisation; diversification; stable reproduction; disengagement

Zusammenfassung

Entwicklungen im Agrarsektor, wie beispielsweise die laufenden Reformen der Europäischen Gemeinsamen Agrarpolitik und die steigende Volatilität der Märkte, stellen tiefgreifende Herausforderungen für landwirtschaftliche Haushalte dar, insbesondere in sehr stark von den Reformen betroffenen Sektoren wie der Milchwirtschaft. Es ist anzunehmen, dass die einzelnen Landwirte und Landwirtinnen als Reaktion auf diese Entwicklungen unterschiedliche strategische Ansätze für ihre landwirtschaftlichen Aktivitäten (landwirtschaftliche Haushaltsstrategien) entwickeln, die einerseits das Überdenken bereits bestehender Strategien, andererseits die Entwicklung neuer Strategien umfassen, sowohl innerhalb als auch außerhalb der Landwirtschaft. Um diese Entwicklungen der landwirtschaftlichen Haushaltsstrategien abschätzen und besser verstehen zu können, ist als erster Schritt die Ermittlung der derzeitigen Struktur der landwirtschaftlichen Haushaltsstrategien notwendig. Die vorliegende Studie leistet einen Beitrag zur Ermittlung dieser Struktur und identifiziert landwirtschaftliche Haushaltsstrategien österreichischer Milchviehbetriebe. Sekundäre Analysen des Datenmaterials aus einer Erhebung durch die Bundesanstalt für Agrarwirtschaft Wien liefern die notwendigen Informationen für die empirische Identifikation von landwirtschaftlichen Haushaltsstrategietypen. Die Analysen enthüllen eine Struktur von sechs landwirtschaftlichen Haushaltsstrategien österreichischer Milchviehbetriebe: 1) Betriebe der echten Spezialisierung, 2) Betriebe der Konzentration, 3) Betriebe der horizontalen Diversifizierung, 4) Betriebe der lateralen Diversifizierung, 5) Betriebe der stabilen Reproduktion und 6) Rückzugsbetriebe. Die Studie hebt die Bedeutung von sozioökonomischen, demographischen und betrieblichen

Charakteristika hervor, die auch zur Identifizierung und Beschreibung der landwirtschaftlichen Haushaltsstratgietypen herangezogen wurden.

Schlüsselwörter

Milchwirtschaft, Landwirtschaftliche Haushaltsstrategien, Professionalisierung, Diversifizierung, Stabile Reproduktion, Rückzug

1 Introduction

Previous policy reforms in the agriculture sector (EUROPEAN COMMISSION, 2009; EUROPEAN COURT OF AUDITORS, 2009; FAHLBUSCH et al., 2010) and predictions for the future volatility of agricultural markets due to a new European Union (EU) Common Agricultural Policy framework after 2013 or the phasing out of the EU milk quota system in 2015 suggest that individual farmers must develop reactionary strategic approaches to their future farming activities (farm household strategies). When faced with a declining income from farming activities and a high level of dependency on public funding (BMLFUW, 2010) as a result of these developments, farmers are often forced to reconsider existing approaches and to develop new strategies, both on and off the farm.

Recent research has emphasised questions relating to farm household strategies which analyse the changes in family farm household strategies, and in particular diversification strategies (ILBERY, 1991; BOWLER et al., 1996; ILBERY and KNEAFSEY, 1998; TURNER et al., 2003; MAHONEY et al., 2004; ZANDER et al., 2008; BARBIERI and MAHONI, 2009; EVANS, 2009; MAYE et al., 2009). However, as EVANS (2009) notes, there are still unanswered questions concerning the pattern of adjustment of farm household strategies to changes in the agriculture sector, and especially for specific regions. The identification of different types of farm household strategy in farms that are exposed to rapid agricultural change, such as dairy farms, is of particular interest. Future reforms will affect dairy farms more than other areas of the agriculture sector due to the phasing out of certain policy measures (e.g., the European milk quota system) and the increasingly volatile milk market (EUROPEAN COURT OF AUDITORS, 2009; FAHLBUSCH et al., 2010).

Recent research has dealt with the development of milk production in several European countries (LASSEN et al., 2009; ROTHFUß et al., 2009). However, the identification of a specific pattern of types of farm household strategy has been neglected. Therefore, this paper examines the various types of farm household strategy pursued by Austrian dairy farmers in order to better understand farm household development.

The paper is structured as follows: first, a literature review of established types of farm household strategy in agricultural research and the relevant factors is provided. This review serves as a basis for the subsequent development of a model of types of farm household strategy, which gives the theoretical framework for the identification of types of farm household strategy. The next section provides the methodology for the analysis and identification of the types of farm household strategy pursued by the Austrian dairy farmers. The analyses in the subsequent section draw upon a dataset which was generated from a survey of the characteristics and plans of Austrian dairy farm households. The data were collected using a questionnaire survey of Austrian dairy farmers conducted by the Federal Institute of Agricultural Economics Vienna in 2007 (KIRNER and KRAMMER, 2008). This survey was conducted in order to analyse the effects of the reform of the Common Agricultural Policy on the strategic decisions of Austrian dairy farmers. These data provided the necessary information to empirically identify types of farm household strategy in the next step. As the structure of Austrian farming is characterised by family farms, it is particularly important to understand the farm family life cycle (POTTER and LOBLEY, 1996) and family farms' strategic decision-making as a consequence thereof. Strategic decision-making on family farms is influenced by the sometimes conflicting demands of farm and family (GASSON and ERRINGTON, 1993; VOGEL and WIESINGER, 2003). Therefore, various farm household strategies were analysed according to differences in socio-economic and demographic factors, which also provide indications as to the farm family life cycle. Finally, the empirically identified farm household strategies of Austrian dairy farms were compared with types which were predefined by the original model in order to categorise them as types of farm household strategy.

2 Theoretical Background – The Model of Types of Farm Household Strategy

In agricultural sciences, the term 'strategy' has been discussed in connection with the survival of family farms and farm adjustment due to changing agricultural policy conditions (DASKALOPOULOU and PETROU, 2002; LOBLEY and POTTER, 2004; MEERT et al., 2005; EVANS, 2009). Strategies can also be seen as the result of individual conceptualisations of life, which can vary considerably within similar structures (VOGEL, 2005). With regard to family farms and the scientific debate surrounding their structure and function, it is important to draw on the notion of a *farm household strategy* (SCHMINK, 1984). This term emphasises the fact that decision-making processes in family farm households always occur within the scope of the conflicting priorities of farm and family (GASSON and ERRINGTON, 1993; VOGEL and WIESINGER, 2003). The family farm household represents the central arbitrator in the coordination of the needs of the family and the farming business (LARCHER, 2007; LARCHER and VOGEL, 2008) and correlates directly with the farming business (GASSON and ERRINGTON, 1993; DJURFELDT, 1996). Family farms also tend to have cyclical histories (farm family life cycles) which influence the development of the farming business over time (POTTER and LOBLEY, 1996) with further consequences for farm household strategies. The succession perspective and the age of the principal farm operator, as indicators of the farm family life cycle, have a decisive effect on farm management (CALUS and VAN HUYLENBROECK, 2008).

Following the scientific debate of the late 1980s and early 1990s in the field of agricultural science (DAX et al., 1993; KNICKEL, 1996; JACOBS, 1992), three principal types of farm household strategy can be defined: (1) *professionalisation*, (2) *stable reproduction*, and (3) *disengagement*.

Farms that pursue the strategy of *professionalisation* are highly market-oriented and operate in a commercial manner. Professionalised farms commonly follow the growth paradigm; the means of production and resources are used purposely for agricultural production (DAX et al., 1993). Farming activities are seen as the primary source of income on such farms in the medium and long term (KNICKEL, 1996). Professionalisation integrates the strategic action field of market penetration with those of market and product development. A dairy farm becomes increasingly more professional when efforts are made to increase farm resources (i.e., to acquire a higher number of milk cows or a larger area of farmland) in an attempt to increase the economic efficiency of the milk production process (i.e., increasing milk yield and/or delivery or increasing feeding efficiency), with the ultimate goal of increasing the overall milk production rate. A more detailed consideration shows that the strategy of professionalisation can be differentiated into two distinct subtypes: *specialisation* and *diversification*.

The specialisation of a family farm entails concentrating on one specific market segment in order to attain a competitive advantage due to experience curve effects. This can be further differentiated into *genuine specialisation* and *concentration* or *integration* (ZANDER et al., 2008). Genuine specialisation occurs when the farm's focus lies on one or two separate farming activities. Concentration or integration, by contrast, occurs when a farm specialises in more than two, but fewer than four, successful farming activities. Such farms have a tendency towards diversification, the second subtype of professionalisation.

Diversification implies an increase in the complexity of farming activities. This is achieved by identifying opportunities to broaden previous high-priority farming activities into completely new or adjacent markets and farming activities (ILBERY, 1991; JACOBS, 1992; ZANDER et al., 2008). Diversification is often seen as a strategy that allows small farms to sustain and increase their income (TURNER et al., 2003; MAHONY et al., 2004; MEERT et al., 2005; BARBIERI and MAHONEY, 2009). Diversification can be conceptualised in terms of three subcategories of farm household strategy: (i) *horizontal*, (ii) *vertical*, and (iii) *lateral diversification* (JACOBS, 1992). Horizontal diversification involves expanding into products that are directly related to the existing product range. This involves cultivating new crops or farming activities which are related to those which already exist (i.e., various forms of fattening feed as a complement to dairy farming). Vertical diversification (vertical integration) aims to expand the business by integrating upstream and downstream farming activities, such as on-farm processing of the farm's own products or farmer-to-consumer direct marketing. The reduction of operating costs is seen as one advantage of this strategy (ZANDER et al., 2008). The establishment of completely new markets and product ranges is referred to as lateral diversification. In such instances, the new activities or products are in no way related to previous farming activities on the family farm in ques-

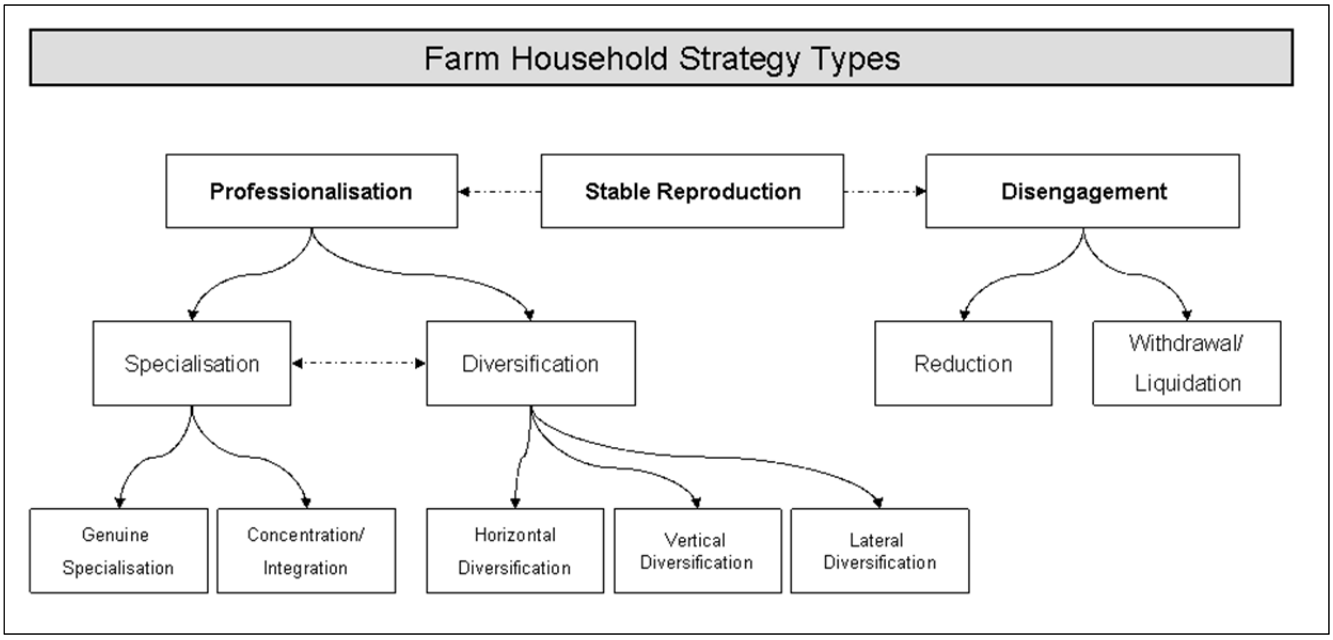
tion. In the context of dairy farming, milk production provides only one of many sources of revenue. The income generated through milk production would then be supplemented by other sources of income that are somehow related to milk production, such as agro-tourism, services (i.e., machinery services) or renewable energy production.

Stable reproduction refers to those farm households that exhibit no significant changes in their farming activities and are characterised by static farming conditions (DAX et al., 1993; KNICKEL 1996). The farm household strategy of stable reproduction is often connected with unsettled farm succession (KNICKEL, 1996). Depending on the life cycle stage of the family in question, stable reproduction may be either a precursor to disengagement or the recommencement of professionalisation. The agricultural literature proposes no explicit subcategories associated with the strategy of stable reproduction. In the context of dairy farming, farms that follow this farm household strategy would experience constant milk production or a slight decrease, with no future investment plans concerning farming activities or other plans for on- or off-farm activities.

Disengagement, the third principal strategy, involves the gradual or immediate withdrawal from farming with no attempt to establish new farming activities. Disengagement is characterised by a decrease in human labour and capital expenditure on farming activities. The decision to disengage is often related to the low income of the family farm in question (KNICKEL, 1996). Once again, there is a strong connection with the farm family life cycle, as this strategy goes hand-in-hand with semi-retirement or retirement in instances when there is no successor to manage the farm (BOWLER, 1992; DAMIANOS and SKURAS, 1996; WEISS, 1999). Land and labour are released by the owner. This farm household strategy can be divided into two subcategories: *reduction of farming activities* and *withdrawal* or *liquidation* (SCHREYÖGG, 1984; INDERHEES, 2006). In the former, the amount of land and labour involved in farming are decreased. The activities of the farmers involved are increasingly oriented off-farm (KNICKEL, 1996). The complete termination of on-farm activities (i.e., the cessation of milk production and other farming activities on dairy farms) due to retirement or other family reasons (i.e., the ill health of family members, generation conflict) is the end result of the latter strategy.

The model in figure 1 integrates these established farm household strategies into a single scheme and illustrates the connections between them. Following on from the outlined description of farm household strategies, the model consists of the three main strategy types (professionalisation, stable reproduction, and disengagement) on the first level and two subsequent levels of farm household strategies. The second level contains specialisation and diversification as subtypes of the strategy of professionalisation, and reduction of farming activities as well as withdrawal/liquidation as

Figure 1. Model of types of farm household strategy



Source: based on the definitions of farm household strategies by JACOBS (1992), DAX et al. (1993), KNICKEL (1996) and ZANDER et al. (2008)

subtypes of disengagement. The model proposes no explicit subtypes of the strategy of stable reproduction on the second and third levels. The third level of the model consists of the strategies of genuine specialisation and concentration/integration as subtypes of the strategy of specialisation, as well as horizontal, vertical, and lateral diversification as subtypes of diversification. The model takes into account that diversified farms may exhibit a tendency towards specialisation (and particularly towards concentration) and vice versa (bidirectional arrow, see figure 1).

3 Materials and Methods

The identification of the types of farm household strategy pursued by Austrian dairy farmers was based on secondary data analyses of a dataset that was collected by the Federal Institute of Agricultural Economics Vienna in 2007. The data collection was carried out by means of a questionnaire survey of Austrian dairy farmers which focussed on the effects of the reform of the Common Agricultural Policy on the structure and strategic orientation of Austrian dairy farmers. The questionnaire was sent out to a random sample of Austrian dairy farmers registered during a twelve-month period in 2006/07 in the Integrated Administration and Control System (IACS)[1] (N = 42,995 farms). The random sample consisted of 1,500 farms in order to reach the minimum sample size (SCHWARZ, 1975). In total, n = 537 questionnaires were available for analysis, which equated to a response rate of 35.8%. The questionnaire included a series of questions about plans, future farming objectives, strategic planning, farm characteristics, and socio-economic as well as demographic characteristics. These questions formed the basis of the secondary analyses provided in this paper. In order to identify the types of farm household strategy pursued by the Austrian dairy farms, it was assumed that:

- Each Austrian dairy farm was following only one type of farm household strategy at the time of the survey. Thus, the farm household strategies of the individual dairy farms could be clearly classified into types of farm household strategy with the help of mathematical-statistical methods;
- These empirically identified types of farm household strategy comply with the theoretical model outlined in the previous section and can be assigned to the types of farm household strategy shown in the model or established as new types of farm household strategy;
- The socio-economic and demographic characteristics obtained from the survey not only contributed to the description and identification of the clusters, but also provided significant information to support the designation of the empirically identified types of farm household strategy.

The following steps were used to analyse and identify the strategy types: first, the Austrian dairy farms were classified according to their farm household strategy by means of a statistical cluster analysis. To be able to characterise and further profile the clusters in order to identify which cluster corresponded to which farm household strategy type, as shown in the model, a comparison of mean values using an ANOVA (F-test) or contingency table analyses (global: χ^2; local: adjusted residuals analysis) was applied in the second step, depending on the scale level of the variables. These analyses were conducted using the Statistical Package for the Social Sciences (SPSS). Finally, a comparison of the significant factors in the identified clusters and the strategy types from the model led to the designation of the empirically identified types of farm household strategy.

3.1 Identification of Types of Farm Household Strategy by Means of Cluster Analysis

In order to identify the types of strategy pursued by Austrian dairy farmers, the k-means method of clustering was used, as this technique seeks to minimise the variability within clusters and to maximise the variability between clusters (LANDAU and EVERITT, 2004). The application of the k-means method requires metrically scaled variables. Binary data can be processed as metric data in the analysis (cf., the generalised linear model, MCCULLAGH and NELDER, 1989; BACKHAUS et al., 2006; HARDIN and HILBE, 2007). In the course of a cluster analysis, the classical *explorative* analysis strategy is applied, with the Euclidean distance as a basis. Nine cluster analyses are accomplished in a stepwise procedure (from a two-part solution to a 10-part solution). The results of the ANOVA (F-test) indicate clearly which item difference between the specific clusters is statistically significant. At the same time, clusters are searched that

[1] For the completion of direct payments in the context of the Common Agricultural Policy and certain supporting regulations, the EU Member States, according to regulations, must have an IACS. This system represents a database of all farms in the EU that apply for direct payments (BMLFUW, 2010).

show only a small degree of variation in the number of cases.

In this study, the variables used to create the clusters (production planning indicators) included plans relating to and extending beyond milk production. In addition, variables were included that conveyed information about off-farm activities. The information about the farmers' plans derived from the survey facilitated the interpretation and determination of the inner homogeneity and outer heterogeneity of the clusters. Table 1 summarises the variables which were used in the cluster analysis.

Table 1. Production planning indicators applied during the cluster analysis that allow the initial identification of types of farm household strategy

Plans concerning milk production
Rear more cows
Increase milk yield
Feed cows more by grazing
Increase dairy delivery
Change to year-long silage feeding system or total mixed rations (TMR)
Increase feeding efficiency
Plans concerning other on- or off-farm activities
Work more off-farm
Start/enhance energy production
Enhance other farming activities
Enhance other services (e.g., Machinery Ring Association)

Source: based on the variables of the questionnaire survey

The variables were selected due to the following considerations regarding their indication of types of farm household strategy: variables that display the growth paradigm, the significance of economic aspects, large areas of farmland, and technological tendencies needed to be considered in order to identify farms' professionalisation strategies (ZANDER et al., 2008). In the case of dairy farming, there is evidence for professionalisation in the intensification of milk production with variables such as 'rear more cows', 'increase dairy delivery', and 'increase milk yield'. The professionalisation of feeding management is reflected in the variables 'change to year-long silage feeding system or TMR' and 'increase feeding efficiency'. The variable 'feed cows more by grazing', on the contrary, can be seen as an indicator of a less intense milk production process. Diversification can be detected in the variables 'enhance other farming activities', 'start/enhance energy production', 'enhance other services', and 'work more off-farm'. These variables also created a distinction between horizontal, vertical and lateral diversification in the later analysis. Disengaging farms were identified using the variable 'work more off-farm'. However, in order to identify clearly the strategies of disengagement and stable reproduction, it was necessary to identify the static conditions on farms that follow the stable reproduction strategy (DAX et al., 1993). In the survey, these farms were identified as those which expressed a low approval of the plans available in the questionnaire. The variables in the survey were designed to indicate development tendencies that are connected with future plans. An absence of future plans indicates stagnation or a willingness to wait, both of which indicate stable reproduction and/or disengagement. In order to confirm this assumption, further analyses were required in order to refine, validate and profile the clusters by means of ANOVA and contingency table analyses in the next step.

3.2 Validation and Characterisation of Clusters with ANOVA and Contingency Table Analyses

In order to characterise and profile the clusters, ANOVA and contingency table analyses were conducted with χ^2 tests on the global and adjusted residuals analyses at the local level. These tests allowed the specific differences between the clusters to be accentuated (LAUTSCH and THÖLE, 2005; BACKHAUS et al., 2006; BÜHL, 2006; NORUSIS, 2009). The adjusted residuals analyses are test statistics with normal distribution (local tests), which are comparable to confirmatory factor analysis. Adjusted residuals analysis is the only method that allows the identification of distinct types and anti-types (BISHOP et al., 1975; HABERMAN, 1973; HABERMAN, 1974, LAUTSCH and VON WEBER, 1995). The statistical residuals tests were calculated by means of a log-linear model. The pertinent significance barrier lay within a significance level of a = 0.05 equal 1.96 (for a = 0.01 equal 2.58). If the adjusted residual is higher than the level of significance, a statistically secure cell frequency can be stated. A positive statistically secure cell frequency is typical abundance; negative residuals are atypical abundance (VON EYE, 1990; LAUTSCH and VON WEBER, 1995).

The contingency table analyses in this paper include the clusters provided by the cluster analysis and

variables concerning the intensity of future milk production, general farming conditions and personal characteristics. First, a contingency table analysis was carried out with variables that specified the intensity of future milk production in order to confirm the previously identified types of farm household strategy. This was necessary, as the cluster analysis alone did not provide sufficient information about the cluster-specific intensity of milk production. The initial suggestion of including the variable concerning the intensity of future milk production in the cluster-building process was rejected due to the nominal level of measurement of this variable. Instead, a contingency table analysis was conducted which included these variables in the analysis. Table 2 shows the variables which were applied in the first contingency table analysis. These variables validated and refined the identified clusters, as the intensity variables needed to correspond with the clusters identified based on on- and off-farm plans.

Table 2. Variables applied for the validation of the clusters by means of contingency table analyses

Intensity of milk production: In the next five years, we want to …
… produce and/or sell more milk
… produce and/or sell approximately the same amount of milk
… produce and/or sell less milk
… stop producing and/or selling milk

Source: based on the variables of the questionnaire survey

Further contingency table analyses with farm characteristics, farming practices and location of farms, and socio-economic as well as demographic characteristics were conducted. Table 3 shows the variables which were applied in the contingency table analyses, which included variables that indicate the farm family life cycle (farm succession, age). The types and anti-types which resulted from the contingency table analyses subsequently allowed the characterisation of the clusters.

In the following section, a direct comparison of the characteristics of the empirically identified clusters and the types of household strategy outlined in the model, coupled with an evaluation, will provide information about the conformity of the results to previously established types of farm household strategy and the appearance of any new types of farm household strategy. Finally, this will lead to the designation of the clusters as types of farm household strategy.

Table 3. Variables applied for the characterisation of the clusters by means of contingency table analyses

Farm characteristics
Size of delivery quota
Size of direct sales quota
Size of area of farmland
Size of arable land
Size of grassland
Number of cows
Form of farming (organic farming/conventional farming)
Difficulty of farming (mountain farming/ non-mountain farming)
Socio-economic and demographic characteristics
Gender of principal farm operator
Educational level of principal farm operator
Farm succession
Further educational training
Age of principal farm operator

Source: based on the variables of the questionnaire survey

4 Results – Types of Farm Household Strategy pursued by Austrian Dairy Farmers

4.1 General Description of the Sample Farms

In contrast to a number of other European countries, in Austria, milk is primarily produced on small family farms (in 2007, the average Austrian dairy farm was 19.3 ha in size and maintained 10.5 milk cows; BMLFUW, 2010). The milk production process in Austria is labour-intensive. This can be attributed to the fact that most milk production takes place on farms which are commonly located in demanding and challenging landscapes.[2] The dairy farmers who responded to the survey had farms which were slightly above the Austrian average in terms of the number of cattle and milk cows, as well as the milk delivery quota. Nearly three-quarters of the respondent farmers worked on

[2] In total, 49% of Austrian farms are mountain farms. A farm's designation as a mountain farm is based on a minimum allocation of Mountain Farm Cadastre points. The points are distributed according to inclination, sea level, climate values, the soil climate index, and farm accessibility factors, as determined by the regulations of the Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW, 2010).

mountain farms. Overall, these farms had a smaller farm structure than non-mountain farms in terms of the number of cows and the milk delivery quota. Table 4 displays the most important characteristics of the sample farms in comparison to the basic population of dairy farmers in Austria.

Table 4. Farm characteristics

Characteristic	Sample	Basic population
	Unit (AM)	
Delivery quota	67.3 t	60.6 t
Direct sales quota	2.2 t	2.7 t
Area of farmland	20.2 ha	19.3 ha
Arable land	10.9 ha	10.0 ha
Grassland	13.6 ha	12.2 ha
Number of cows	14.6 heads	10.5 heads
	Share (%)	
Organic farms	18	17
Mountain farms	71	72

Source: based on BMLFUW (2010) and data from questionnaire survey

The gender distribution of the principal farm operators was balanced across the sample farms: about one-third of the farms were managed by men, while another third was managed by women. In the remaining farms, both genders shared the management responsibilities. The average age of the male principal farm operators was 58.6 years, while the female principal farm operators were slightly younger. The proportion of farm operators who were 55 years or older was significantly higher in small farms than in farms with a milk quota of over 100 t (24% vs. 11%). As regards education, only 1% had achieved higher agricultural education or university certification. About one-third did not have a specific education in agriculture; most of these respondents were found on the smaller farms (44%). In addition, 27% of the farmers did not have a successor and on 44% of the farms, farm succession was not yet an issue. The level of uncertainty regarding succession was significantly higher on the smaller farms; nearly half of the older farmers (55 years or older) has no successor.

4.2 Identification of Clusters within Austrian Dairy Farms

Cluster analysis (SPSS/k-means clustering) relating to production planning indicators (plans concerning milk production in the next five years, other plans concerning on- and off-farm activities) identified the following five clusters (see table 5):

Cluster 1 indicates intensification tendencies according to plans to increase feeding efficiency, the milk yield, the delivery quota, and the number of cows. The farms in cluster 2, however, emphasised the expansion of their farming activities, and the intensification of milk production was not their main goal. The farmers in cluster 3 showed a very low level of approval of all of the plans and thus were not pursuing any of the given plans to a significant extent. Cluster 4 indicated a strong agreement with off-farm activities and, in addition, a desire to remain in milk production and cattle breeding, which was confirmed by their approval of increasing feeding efficiency in

Table 5. Clusters of Austrian dairy farms according to production planning indicators

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Number of farms	89	111	220	60	57	537
Share of total sample (%)	16.5	20.7	41.0	11.2	10.6	100
Production plans for the next five years (multiple answers allowed)	**Approval of plans (%)**					**P**
Rear more cows	**56**	5	5	8	**81**	0.000
Increase delivery quota	**62**	0	3	8	**75**	0.000
Increase milk yield	**84**	13	5	32	**81**	0.000
Change to year-long silage feeding system or TMR	19	4	2	5	11	0.000
Feed cows more by grazing	9	6	5	22	18	0.000
Increase feeding efficiency	**100**	**51**	0	**75**	30	0.000
Work more off-farm	9	8	20	**78**	9	0.000
Enhance other farming activities	3	**77**	0	8	**53**	0.000
Start/enhance energy production	17	16	7	8	14	0.045
Enhance other services (e.g., Machinery Ring Association)	9	2	12	**53**	9	0.000

Note: Variables with an approval rating of more than 50% are marked in bold.
Source: cluster analysis

connection with dairy farming. Cluster 5 resembles cluster 1 inasmuch as milk production is to be intensified. However, more than half of the farmers in cluster 5 also agreed on the enhancement of other farming activities (e.g., fattening feed).

4.3 Validation and Characterisation of the Empirically Identified Clusters

An examination of the intensity of milk production, the farm characteristics, farming practices and the socio-economic as well as demographic characteristics of the five identified clusters provided information which was used to identify the types of farm household strategy. The analyses of these variables also allowed differentiation between the clusters.

Table 6 shows that at the global level, the difference in intensity between the clusters was statistically significant. In addition, the adjusted residuals analysis provided information concerning the significance of the differences at the local level.

The χ^2 test result indicates that the five clusters differed significantly at the global level with regard to the intensity of their milk production. The adjusted residuals (local level) in table 6 provide detailed information (at an α-level of 1%) regarding the differences between the clusters. Thus, the adjusted residuals of 8.4 and 8.0 for clusters 1 and 5, respectively, stress the outstanding position of these clusters regarding the plan to 'produce and/or sell more milk' and clearly indicate intensification (typical abundance). For clusters 2 and 3, this plan is clearly atypical. The adjusted residuals of cluster 2 indicate that the farms in this cluster do not intend to change the intensity of their milk production. The farms within cluster 3 formed two distinct groups, allowing for the conclusion that two different farm household strategy subtypes are contained within cluster 3: the first indicated static milk production (subtype A, 72.2% of the respondents in cluster 3), while the other planned to terminate milk production (subtype B, 16.8%). The negative adjusted residuals concerning the intensity of milk production in cluster 3 indicate that the farmers in this cluster do not intend to follow this plan. The remaining 11.0% of cluster 3 gave non-significant information about their medium-term plans and therefore cannot be assigned to either of the two subtypes or to a separate subtype. Cluster 4 was not conspicuously typical or atypical regarding future milk production plans.

Arable land and grassland, the number of cows and the delivery and direct sales quotas were classified as general farming conditions for a further contingency table analysis. The influence of these variables on the empirical cluster structure was examined using an ANOVA, including a post-hoc test (Bonferroni test). Table 7 shows the cluster-specific mean values of the five characteristics outlined above.

The p-values in the last column show that the clusters differed significantly with regard to their delivery quotas, arable land, grassland and the number of cows. Only the direct sales quota did not reveal a significant difference between the clusters.

Table 8 displays the contingency table analysis of the farming practices and the location of the farms in the clusters. On the global level as well as on the local level, both variables showed no statistically significant differences between the clusters, with the exception of cluster 2: the adjusted residuals indicate that the farms in this cluster are typically organic. The

Table 6. Contingency table analysis of clusters with intensity of milk production

Intensity of milk production in the next five years		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Produce and/or sell more milk	Approval of plan (%)	56.2	4.8	6.7	16.9	64.3
	Adjusted residuals	**8.4****	*-4.8*	*-7.0*	-1.0	**8.0** **
Produce and/or sell the same amount of milk	Approval of plan (%)	42.7	78.8	72.2	74.6	35.7
	Adjusted residuals	*-4.8*	**3.4****	**2.9** **	1.7	*-4.8*
Produce and/or sell less milk	Approval of plan (%)	0	6.8	4.3	3.4	0
	Adjusted residuals	-0.2	2.0	0.9	0.0	-1.5
Stop producing and/or selling milk	Approval of plan (%)	1.1	9.6	16.8	5.1	0
	Adjusted residuals	*-3.0*	0.0	**4.7****	-1.2	*-2.6*
Total	Absolute number	89	104	208	59	56
						[χ^2 = 35.1; df = 8; p = 0.000]

Explanatory note concerning the interpretation of the adjusted residuals: An adjusted residual of **8.4** (bold number in the second cell of cluster 1), for example, means that an increase in milk production is typical of the farms in cluster 1. An adjusted residual of *-4.8* (italic number in the second cell of cluster 2) means that an increase of milk production is atypical of farms in cluster 2.
Source: contingency table analysis

Table 7. Farm characteristics in the clusters

		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	ANOVA (p)
Delivery quota (t)	AM ± SD *	109.2 ± 68.1	66.3 ± 62.7	39.6 ± 44.2	55.4 ± 37.8	91.9 ± 112.61	0.000
Direct sales quota (t)	AM ± SD *	2.4 ± 16.5	0.9 ± 2.5	0.9 ± 6.1	3.7 ± 21.9	2.6 ± 13.9	0.420
Arable land (ha)	AM ± SD *	9.6 ± 10.8	6.3 ± 7.6	4.8 ± 9.8	5.6 ± 9.3	8.6 ± 10.6	0.001
Grassland (ha)	AM ± SD *	17.6 ± 9.3	13.8 ± 9.8	9.1 ± 7.1	11.9 ± 6.8	17.9 ± 15.9	0.000
Number of cows (heads)	AM ± SD *	20.8 ± 8.9	15.2 ± 9.7	10.6 ± 7.7	12.6 ± 6.3	18.7 ± 18.1	0.000

*AM ± SD = Mean value plus/minus standard deviation
Source: cluster analysis

Table 8. Contingency table analysis of clusters with farming practices and location of farms

		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Organic farm	Share (%)	17.7	29.1	34.4	11.5	7.3	96
	Adjusted residuals	0.3	**2.2***	-1.3	0.0	-1.2	
Conventional farm	Share (%)	16.4	19.0	41.7	11.3	11.6	432
	Adjusted residuals	-0.3	*-2.2*	1.3	0.0	1.2	
							[$\chi^2 = 6.4$; df = 4; p = 0.174]
Mountain farm	Share (%)	17.0	20.2	43.1	9.4	10.3	371
	Adjusted residuals	0.3	-0.6	1.7	-1.6	-0.7	
Non-mountain farm	Share (%)	16.0	22.4	35.3	14.1	12.2	156
	Adjusted residuals	-0.3	0.6	-1.7	1.6	0.7	
							[$\chi^2 = 4.6$; df = 4; p = 0.333]

Source: contingency table analysis

remaining clusters were equally likely to farm organically or conventionally and were found in both mountainous as well as non-mountainous areas.

The socio-demographic and personal characteristics of the farmers were subjected to further contingency table analyses. Table 9 demonstrates that all of the relevant characteristics revealed significant differences between the clusters according to the adjusted residuals.

The adjusted residuals show that the farms in cluster 3 were typically led by female principal farm operators, while those in cluster 4 were led by males. The farm operators with the highest level of agricultural education were found in cluster 1, whereas cluster 3 was dominated by operators with exclusively practical experience. This is also the cluster in which farm succession was typically insecure. In cluster 4, by contrast, farm succession was not yet an issue. The oldest operators were found in cluster 3, whereas younger farmers were typical in clusters 1 and 5. The adjusted residuals for the anti-types consolidated these findings.

4.4 Classification and Assignation of the Empirically Identified Clusters to the Model of Types of Farm Household Strategy

Based on the findings, the description of the farm and farmers characteristics and the differences between the five empirically identified clusters, all of the clusters correspond to the types of farm household strategy outlined in the model in figure 1. The five clusters were categorised into six distinct types of farm household strategy pursued by Austrian dairy farmers, as one cluster needed to be divided into two divergent types of farm household strategy. The final six empirically identified types of farm household strategy covered all three principal types: farms of genuine specialisation (cluster 1) and concentration (cluster 5) as subtypes of specialisation/professionalisation; farms

Table 9. Contingency table analysis with socio-economic and demographic characteristics

		Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Male principal farm operator	Share (%)	20.1	20.6	30.2	16.6	12.5	199
	Adjusted residuals	1.6	-0.1	*-3.8*	**3.1****	1,0	
Female principal farm operator	Share (%)	11.6	20.1	55.5	7.9	4.9	164
	Adjusted residuals	*-2.1*	-0.2	**4.7****	-1.6	*-2.9*	
Male and female principal farm operators	Share (%)	17.9	21.6	38.3	7.8	14.4	167
	Adjusted residuals	0.5	0.3	-0.7	-1.7	1.8	
							[χ^2 = 35.1; df = 8; p = 0.000]
Exclusively practical experience	Share (%)	12.7	15.1	57.2	9.6	5.4	166
	Adjusted residuals	-1.7	*-2.2*	**2.2***	-0.8	*-2,7*	
Vocational school or technical college	Share (%)	17.1	22.4	35.4	12.9	12.2	263
	Adjusted residuals	0.2	0.8	*-2,2*	1.2	1.0	
Agricultural master craftsman	Share (%)	21.1	26.3	26.3	10.5	15.8	95
	Adjusted residuals	1.2	1.4	*-3.0*	-0.3	1.7	
Higher agricultural education/university	Share (%)	50.0	33.3	0	0	16.7	6
	Adjusted residuals	**2.2***	0.8	*-2.0*	-0.9	0.5	
							[χ^2 = 40.9; df = 12; p = 0.000]
Farm succession not secured	Share (%)	10.2	22.4	55.1	6.5	5.8	138
	Adjusted residuals	*-2.5*	0.4	**4.4****	*-2.2*	*-2.2*	
Farm succession secured	Share (%)	20.3	18.3	37.8	10.1	13.5	148
	Adjusted residuals	1.2	-1.0	-0.5	-0.7	1.3	
Farm succession not yet an issue	Share (%)	19.5	22.1	31.4	15.1	11.9	226
	Adjusted residuals	1.3	0.5	*-3.3*	**2.1***	0.8	
							[χ^2 = 38.,8; df = 12; p = 0.000]
Attendance of fewer than three agricultural education units per year	Share (%)	11.2	22.0	49.6	10.0	7.2	250
	Adjusted residuals	*-3.5*	0.6	**4.4****	-1.1	*-2.4*	
Attendance of three to five agricultural education units per year	Share (%)	20.4	20.9	33.5	10.9	14.3	230
	Adjusted residuals	1.8	0.0	*-2.7*	-0.4	**2.5***	
Attendance of six to 10 agricultural education units per year	Share (%)	36.6	13.4	10.0	30.0	10.0	30
	Adjusted residuals	**2.9****	-1.0	*-3.4*	**3.3****	-0.1	
Attendance of more than 10 agricultural education units per year	Share (%)	33.4	11.1	33.3	11.1	11.1	9
	Adjusted residuals	1.3	-0.7	-0.4	0.0	0.1	
							[χ^2 = 46.4; df = 12; p = 0.000]
Female principal farm operator aged 55 or older	Share (%)	10.2	24.5	56.1	4.1	5.1	98
	Adjusted residuals	-1.5	1.0	**2.3***	-1.7	*-2.0*	
Female principal farm operator aged between 41 and 54 years old	Share (%)	14.5	18.6	47.2	8.3	11.4	193
	Adjusted residuals	-0.1	-1.2	0.4	0.3	0.8	
Female principal farm operator aged 40 or younger	Share (%)	24.5	22.4	22.5	14.3	16.3	49
	Adjusted residuals	**2.1***	0.3	*-3.6*	1.8	1.5	
							[χ^2 = 22.7; df = 8; p = 0.004]
Male principal farm operator aged 55 or older	Share (%)	13.9	20.0	47.9	7.8	10.4	115
	Adjusted residuals	-1.8	-0.2	**3.7****	-1.8	-1.1	
Male principal farm operator aged between 41 and 54 years old	Share (%)	20.9	22.5	31.9	11.6	13.1	191
	Adjusted residuals	0.8	0.9	1.0	-0.5	-0.1	
Male principal farm operator aged 40 or younger	Share (%)	24.6	16.9	16.9	23.1	18.5	65
	Adjusted residuals	0.2	-0.8	*-3.2*	**2.0***	1.4	
							[χ^2 = 25.9; df = 8; p = 0.001]

Source: contingency table analysis

of horizontal diversification (cluster 2) and lateral diversification (cluster 4) as subtypes of diversification/professionalisation; farms of stable reproduction (cluster 3, subtype A); and farms of disengagement (cluster 3, subtype B). The necessity of dividing cluster 3 was due to the divergent strategies used therein. Cluster 3 also revealed a third heterogeneous group of farms. Due to their heterogeneity, these farms could not be aggregated into a separate subtype, neither as a new subtype within the scope of the established types of farm household strategy as outlined in the model nor as a new, coherent type of strategy. Figure 2 shows the relation between the six empirically identified types of farm household strategy and the corresponding types shown in the model described in chapter 2.

The final assignation of the empirically identified types of farm household strategy to the strategy types outlined in the model was based on their description, which is outlined in the following section.

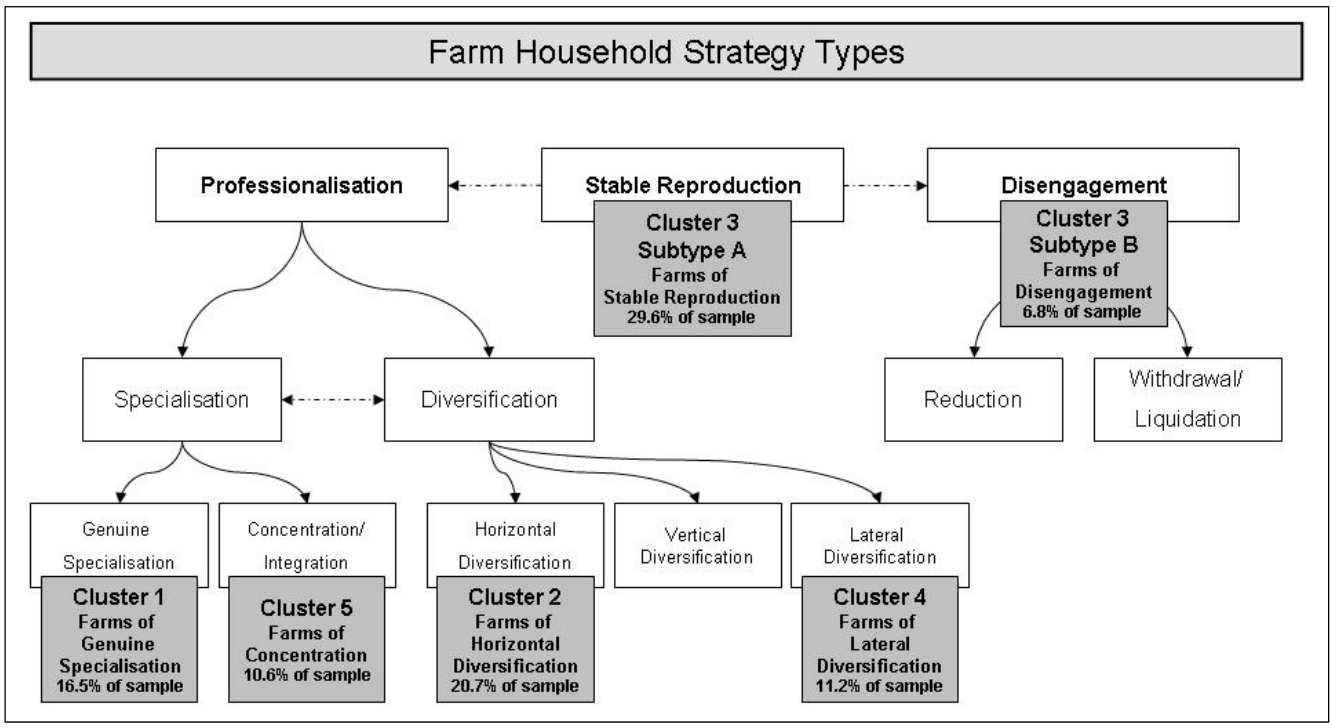
4.5 Description of the Types of Farm Household Strategy

The types and anti-types shown in the analyses provided the basis for the description of the individual clusters, indicating which variables were decisive for the classification and assignation of the various types of farm household strategy. The findings concerning the socio-economic and demographic characteristics of the clusters as well as the evaluation of the variables that provided information about the farm family life cycle contributed to and substantiated the assignation process. The description in this section follows the types of farm household strategy which are outlined in the model (figure 2), and reveals the following types, which constitute the pattern of types of farm household strategy used within Austrian dairy farms:

4.5.1 Farms of Genuine Specialisation (cluster 1)

A total of 89 farms (16.5% of the total sample) were assigned to cluster 1. All of the principal farm operators in this cluster were planning to increase feeding efficiency and definitely planning to increase the delivery yield and delivery quota. These statements are clear indications that the farms in this cluster were aiming to professionalise and intensify their milk production. This tendency was confirmed by an investigation of the intensity grading, which also indicated an increase in the production and/or sale of milk in cluster 1. This is underlined by the fact that these farms had no other plans besides intensifying milk

Figure 2. Model of types of farm household strategy



Note: 4.6% of the respondents in cluster 3 could not be assigned to any one strategy due to their non-significant responses.
Source: based on definitions of farm household strategies given by JACOBS (1992), DAX et al. (1993), KNICKEL (1996) and ZANDER et al. (2008), with the empirically identified types of farm household strategy pursued by Austrian dairy farmers.

production (neither within nor outside of dairy farming), suggesting that these farms are concentrating exclusively on dairy farming. Consequently, these findings imply that the farms in cluster 1 can be designated as *farms of genuine specialisation*. This empirically determined type complies with the theoretical type of household strategy of genuine specialisation, which is a subtype of the professionalisation strategy and also of specialisation (see figure 2).

The characteristics of these farms confirmed this assumption and provided plausible supplementary information for this assignation. Farms of genuine specialisation have the largest farm structure (delivery quota, total arable land and number of milk cows). On average, these farms have 21 cows each; 10 more than in the cluster with the least cows. This suggests that farms of genuine specialisation aim towards the growth paradigm and further expansion, based on an already large farm structure, concentrating on a single, specialised market. No difference was revealed between the form of agriculture and the difficulty of the terrain: farms of genuine specialisation can be found in mountainous as well as non-mountainous areas and are equally likely to be organic or conventional. Farms of genuine specialisation are further characterised by the fact that the farm operators are more highly educated in the field of agriculture and attended the most units of further educational training, and by the fact that farm succession is not an influential factor. Furthermore, it is significant that farms of genuine specialisation have the youngest principal farm operators of both sexes (40 or younger). The assumption that professionalisation/genuine specialisation generally occurs on farms during an earlier life cycle stage (e.g., on farms with younger farmers) confirms this classification.

4.5.2 Farms of Concentration (cluster 5)

Altogether, 57 farms were assigned to cluster 5 (10.6% of the total sample). This cluster consisted of farms that showed an even stronger approval of the plan to intensify milk production than cluster 1 (farms of genuine specialisation). Their strong approval of the plan to increase the number of cows, the milk yield and the dairy delivery underlines this fact. In contrast to the farms in cluster 1, more than half of the farmers in cluster 5 saw a second main activity, such as fattening feed, as an important goal. This plan was less significant in cluster 1. The analysis of the intensity grading further emphasised the high significance of milk production. These farmers wanted to intensify their already successful milk production process and, in line with this specialisation, showed an initial but marginal tendency towards diversification into another field of farming activity. The assumption can be drawn that the farms in this cluster are *farms of concentration*.

The characterisation of these farms with regard to farm characteristics substantiates this assumption: farms of concentration have the second largest amount of arable land, delivery and direct sales quotas and number of milk cows. These farms also have the largest average area of grassland compared with the farms in the other clusters. This indicates that milk production is one way to gain the most value from grassland on those farms. Farms of concentration demonstrated atypical characteristics in terms of their socio-demographic and personal data. The adjusted residuals only underline those characteristics that do not statistically apply to the farmers in this cluster. The respondents in this cluster were generally not female, did not only have practical agricultural experience as their educational background, were not insecure about their farm succession, were not older than 54, and were more interested in further educational training.

4.5.3 Farms of Horizontal Diversification (cluster 2)

In total, 111 farms were assigned to cluster 2 in this analysis (20.7% of the total sample). The respondents in this cluster strongly agreed with the plan to enhance other farming activities outside milk production as well as increasing feeding efficiency. This means that agricultural production is to be extended by at least one other farming activity. The increase in feeding efficiency, however, provides an indication that milk production or at least cattle farming shall be maintained. Plans to intensify milk production were insignificant for these farms. Only a few farms in this cluster planned to produce less milk in the medium term, but these farms were not statistically significant. The plan to expand milk production was not relevant for this cluster. The expansion of the scope of agricultural production by at least one activity apart from milk production supports the conclusion that the farms of cluster 2 planned to diversify. Furthermore, it is obvious that organic farming practices are typical of farms of diversification. The other empirically determined clusters showed no statistically significant difference with regard to this characteristic. The strategy of diversification is believed to minimise risk in smaller farms, according to the literature (MACRAE et al.,

1989), which supports this classification. As regards the area of farmland, the delivery quota and the number of milk cows, the farms of diversification were found to be in the midrange of all of the clusters. These farms showed no statistically significant differences as regards the sex or age of the principal farm operator, farm succession or further educational training. As regards education, it is clear that exclusively practical experience is atypical and thus does not play a role in diversifying farms.

The literature provides a further subdivision of the diversification strategy, according to which the empirical data allow the assumption that the farms in cluster 2 are *farms of horizontal diversification.* This is derived from the fact that the respondents aimed to extend the scope of production using products which are connected to their existing activities; in this case, the development of fattening feed.

4.5.4 Farms of Lateral Diversification (cluster 4)

Out of the 60 farms (11.2% of the total sample) that were categorised into cluster 4, three-quarters expressed an aim to increase feeding efficiency, but not as strongly as the farms in cluster 1. In addition, more than three-quarters of the farmers in cluster 4 were aiming to implement new off-farm activities, while around half of the farmers wanted to offer services such as working for the Machinery Ring Association. However, this alone cannot lead to a conclusion about the type of farm household strategy of this cluster. Only the intensity grading of the milk production shows that most of the farmers in this cluster wanted to maintain the scope of their present milk production process, although this is not statistically significant in this cluster. This suggests that, in addition to maintaining the level of milk production, these farmers are also striving towards other activities that have no direct correlation with their current milk production activities. Nevertheless, it can be assumed that their agricultural activity will be maintained in the future. Accordingly, it is assumed that the farmers in cluster 4 are following the strategy of diversification, as are the farmers in cluster 2. The farms in cluster 4 can be identified as *farms of lateral diversification*, due to the fact that the farmers are planning to develop completely new fields of activity. The characteristics of these farms confirm this assignation: the farms of lateral diversification were the smallest farms in the survey as regards arable land, grassland, delivery quota, and the number of milk cows. This corresponds to the concept that smaller farms tend to diversify in order to be viable (TURNER et al., 2003; MAHONY et al., 2004; MEERT et al., 2005; BARBIERI and MAHONEY, 2009). Nevertheless, the farms in this cluster had the highest direct sales quotas, suggesting that direct sales of milk and milk products are an important pillar for the farms in this cluster. The farms in this cluster were found in both mountainous and non-mountainous areas and were both organic and conventional farms. It is interesting to note that according to the adjusted residuals, farms of lateral diversification are significantly more likely to be led by male principal farm operators. Furthermore, farm succession was not yet an issue for the farms in this cluster. A closer look at the age of the principal farm operators showed that this is due to the fact that the farms were led by farm operators of both sexes who were 40 years or younger. The farmers were also very willing to attend further educational training.

An examination of the spatial distribution of the farms of lateral diversification in Austria revealed that they occur more frequently in the federal state of Tyrol[3]. Tyrol lies within the alpine region of western Austria, and is characterised by a high proportion of extensive grassland, a small amount of arable land and areas suitable for field crops, and the highest number of overnight farm stays in Austria. Around one-third of overnight stays in private homes and an even greater proportion of those in holiday apartments on farms occur in Tyrol (BMLFUW, 2010), thus providing an important additional income for those farms. The empirically determined data also reflect this fact. The respondents from farms of lateral diversification indicated their intention to expand into activities outside milk production and off-farm. For this reason, it can be assumed that these activities are probably in the field of agro-tourism. The maintenance of milk production levels and the high direct sales quota suggest that milk production and tourism are combined on these farms, and the milk is presumably sold directly to the tourists who visit these farmers.

4.5.5 Farms of Stable Reproduction and Farms of Disengagement (cluster 3, subtypes A and B)

In total, 220 farms (41.0% of the total sample) were assigned to cluster 3. The farm operators in this cluster expressed that they did not significantly agree or disagree with the plans in the cluster analysis, and thus that they have no explicit plans for production in

[3] Tables of this analysis are not displayed in this paper due to limitations of space.

the near future. After a closer look at the socio-economic and demographic characteristics, it is obvious that the farms in this cluster are mostly managed by female farm operators, that their agricultural education was based mainly on practical experience and that the farmers showed no interest in further educational training. Farm succession was regarded as problematic on these farms; a high level of statistical significance highlights the insecurity of farm succession. This problem is intensified by the fact that the oldest farm operators were found in cluster 3. Accordingly, it can be assumed that a farm successor would be crucial, and would be a decisive factor in the strategic decision-making process.

The variable of the intensity of milk production indicates that two different subtypes of farm household strategy are subsumed in cluster 3, as outlined in chapter 4.3. Subtype A is characterised by constant milk production, but does not want to change within the field of agriculture or elsewhere. Accordingly, these farms can be seen as *farms of stable reproduction* (subtype A, 72.2% of the respondents in cluster 3), which are characterised by the stagnation of farm development. Subtype B, on the other hand, wanted to withdraw from milk production, but did not provide information on the establishment of new alternatives, within the field of agriculture or elsewhere. Therefore, farms that are assigned to this subtype can be viewed as *farms of disengagement* (subtype B, 16.8%). The remaining 11.0% of cluster 3 gave various answers about their medium-term plans. As can be concluded from their heterogeneity, these farms cannot be assigned to either of the two subtypes, nor embraced in a new and separate subtype of farm household strategy.

5 Conclusions

The rapid agricultural change which has occurred over the past few years, coupled with changes which are expected to take place in the future due to new agricultural policy frameworks, poses important questions concerning the long-term development of the agriculture sector and the adaptation of farm household strategies. As the agriculture sector has significant spill-over effects onto other sectors (SINABELL, 2009), it is vital to understand these developments in order to provide the necessary basis for ongoing policy-making. An examination of the current pattern of farm household strategies provides such a basis and contributes to the current understanding of dairy farm household strategies. To date, very little work has explicitly identified the pattern of types of farm household strategy in a specific agricultural sector, although EVANS (2009) points out that there are still unanswered questions concerning the pattern of adjustment of farm household strategies to agricultural change in recent times and in different locations. In order to reveal a pattern of strategies within Austrian dairy farms, a model was developed that facilitates the assignation of empirically identified types of farm household strategy to a defined set of previously established types of farm household strategy in the literature. Important characteristics (socio-economic, demographic and farm characteristics as well as farming practices and the location of the farms) were examined that underline the assignation of the various types of farm household strategy of Austrian dairy farmers and therefore highlight the pattern of types of household strategy within Austrian dairy farms.

As elucidated by our model, a pattern consisting of six types of strategy emerged: farms of genuine specialisation (16.5%) and concentration (10.6%), which are both strategies of professionalisation, farms of horizontal (20.7%) and lateral diversification (11.2%), farms of stable reproduction (29.6%), and finally farms of disengagement (6.8%). Approximately two-thirds of Austrian dairy farmers use the first four strategies. By adding together the two professionalisation strategies and the two diversification strategies, it can be seen that the types of farm household strategy, together with the strategy of stable reproduction, are equally distributed – with the exception of the strategy of disengagement. The number of farmers who indicated plans to disengage from agriculture was low in comparison to the other strategies, but should not be underestimated: the average decrease in the number of farms in Austria from 2005 to 2007 was only 1.3% (BMLFUW, 2010), which is much lower than indicated in the survey. Structural change in agriculture is an issue in many European countries, including Austria. Thus, it is vital to react to indications of the aforementioned pattern in future policy-making decisions. Two out of the identified six strategy types are diversification strategies with various directions. This leads back to the fact that diversification seems to be regarded as a risk-minimising strategy in smaller agricultural structures (MACRAE et al., 1989), which are predominant in Austria. Farms of horizontal and vertical diversification accordingly represent nearly one-third of Austrian dairy farms.

In addition to the pattern of types of farm household strategy itself, this study highlights three key points: first, that farms in morphologically disadvan-

taged and less competitive areas are no different to farms in more favourable areas as regards farm household strategies for dairy farming. Mountain and non-mountain farms are equally likely to plan to follow one of the listed farm household strategies in the next few years. Difficult farming conditions do not necessarily result in the inevitable closure of a farm, which was previously assumed due to difficult production circumstances and the lesser economic viability of mountain farms. This suggests that a differentiated consideration of mountainous areas may be necessary in further studies due to the fact that a closer consideration might reveal differences between more and less morphologically disadvantaged areas. Clearly, a great deal more research is needed in this field.

Second, it has been demonstrated that well-educated young farm operators tend to specialise and professionalise their milk production process whenever the circumstances allow. If the basic conditions restrict these developments (e.g., through a small area of farmland or a small quota), diversification strategies are adopted in order to compensate for the lack of economies of scale. This supports the conclusion of MEERT et al. (2005), who view diversification as a useful strategy with which to cope with the income-related problems of farm households. As diversification allows farms to adapt to emerging agricultural contexts (BARBIERI and MAHONY, 2009), it makes sense that dairy farms would follow this strategy when expecting agricultural changes.

As a third and main key point, the analyses demonstrate a clear connection between farm household strategy and socio-economic as well as demographic factors, which also indicate the farm's family life cycle, and thus underline the usefulness of these factors for the identification of types of farm household strategy. The farms in the identified categories of farm household strategy can be clearly distinguished as regards these factors, of which farm succession seems to be vital. The additional explanatory value of these factors as regards the assignation of strategy types is illustrated in several ways: production is kept at the same level or slowly phased out on farms that are insecure about a successor, or have none. In the analyses presented in this paper, around 12% of the farms indicated that they would follow the strategy of disengagement. These farms were also those in which farm succession was uncertain and older, female farm operators were managing the farms. Farm succession also appears to be an issue on professionalising and diversifying farms, where the principal farm operators are young or the farm succession is already secured. The farm family life cycle of these farms seems to be still at an early stage. Professionalisation is an issue on larger farms, which again tend to have a secure farm succession. This confirms the results reported by GLAUBEN et al. (2004) in their farm succession study of farm households in Upper Austria, but also underlines the findings of POTTER and LOBLEY (1996), who emphasise the importance of succession status and the influence of the family life cycle on family farm households in the development of farming businesses over time.

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