The Succession Status of Family Farms in the Mediterranean Region of Slovenia

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The Succession Status of Family Farms in the Mediterranean Region of Slovenia. Family farm succession is a complex process in which the farm family plans the transfer of knowledge, labour, skills, management and ownership of the farm business from the parental to the next generation. By developing a multi-attribute decision model, 40 family farms from the Mediterranean region of Slovenia were evaluated regarding their succession status in order to relate two issues: family farm succession and multi-attribute decision modelling. The multi-attribute decision model was developed by using the DEX method, an expert system shell for multi-attribute decision modelling and support. The family farms' data, applied to the model, is part of the study where the standardized questionnaire was used. The results show that the majority of farms have good possibilities for a "smooth" succession process and future survival.
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Key words: *family farms; farm succession; multi-attribute decision model; DEX methodology*

1. Introduction

In the last decades European countryside faced big changes, among them the deagrarization is one most significant. Indeed, in the last forty years in Slovenia the share of rural population decreased from around 50% to only 5% (RDP 2007). Despite of low share of rural population and low share of agriculture in GDP (around 2%) the significance of agriculture is much higher as it seems at the first sight. The multifunctionality of agriculture wins on importance with each year as well the cooperation between agriculture, secondary and tertiary economic sector.

The basic holders of agricultural activities in Slovenia are family farms with more than 99.8% of total agricultural husbandry's (SI-STAT 2013). Family farms are not only working places but also a home to the family members, keepers of local tradition, agricultural landscape and the rural way of life in general. Whether the family farms will remain and develop or decay depend from many factors, among them, the successfully accomplished succession process is stated as one of most important (Fennell 1981; Potter and Lobley 1992; Gasson and Errington 1993; Errington 1998; Calus et al. 2008; Bohak 2006, 2011; Bohak et al. 2011; Kerbler 2003, 2007).

According to Fennell 1981, Gasson and Errington 1993 and Glauben et al. 2004, the family farm succession is a complex process which occurs over a

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long or short time period. This process forms the transition between two stages, in the first of which a farming father is the owner and in the second of which ownership may be in the hands of his children.

Although not so negligible number of farms succession studies in Slovenia where performed, still some general insufficiency of studies could be recognized: they were mostly performed in limited geographical areas (e.g., mountain farms, low land farms), only on farms with specific production orientations (e.g., organic farms, intensive farms), or only regarding some specific socioeconomic problem (e.g., relationship between generations and genders, employment on farm). To overcome this insufficiency we started with a comprehensive and deep study on family farm succession for the total Slovenian area using a standardized FARMTRANSFERS questionnaire (Giraud and Baker 2005), which allowed us not only a sociological understanding of family farms' life cycles, characteristics of farmers and availability of successors, but also a comparison of farms' succession patterns in all regions and countries that used the same standardized questionnaire. The current paper presents a partial survey preformed in the Mediterranean region with the aim to establish the perspective of farms concerning their current succession status.[2] The studied region has good climate conditions, therefore the area is agriculturally well developed and agriculture, next to tourism, is one of the most important economic sectors. The family farms in the Mediterranean region, in comparison to other bio-geographical regions, express favourable socio-economic characteristics, but less convenient farm size structure characteristics.

In examining the family farms, the multi-attribute method (DEX) was used for the analysis. This is a specific method for which a computer based supporting tool, DEXi, has already been successfully used in numerous real-life decision and assessment problems (Jereb et al. 2003; Pažek et al. 2006; Pažek et al. 2010; Rozman et al. 2006; Rozman et al. 2009; Pažek and Rozman 2011).

2. Methodology

The Mediterranean farms under scrutiny here are part of a broader study which comprises samples of 215 farms from the total Slovenian area. The farm selection on the Slovenian level was random. The sample of farms from the Mediterranean region includes forty farms.

[2] For the base research of the family farms' succession status on the total Slovenian surface, the survey was divided according to the Slovenian Landscape Typology (1993) of five bio-geographical regions: Mediterranean region, Alpine region, Sub-Alpine region, Karst region and Sub-Pannonian region.

In this study the standardized questionnaire, developed at the Plymouth University (UK) and used for the FARMTRANSFERS database[3], was applied for our research purposes. The questionnaire survey in the Mediterranean region was finished in 2009. The questionnaires were carried out by well-qualified evaluators and the respondents were the current farm proprietors. The questionnaire contained mostly closed, but some open-ended questions covering the status of the farm succession, farmer retirement plans and attitudes toward farming.

To examine the "perspectiveness" of each family farm, a hierarchical multi-attribute decision model (DEXi model) was used. According to Bohanec et al. (2000), the DEXi methodology is based on the decomposition of a complex decision problem into smaller and less complex sub-problems. The sub-problems are represented by hierarchical variables which are connected by utility functions that serve for the aggregation of partial sub-problems into the overall evaluation or classification of options (Bohanec et al. 2000). The main advantage of this method is its capability of dealing with descriptive values or even uncertain or missing data (Bohanec and Rajkovič 1999). In addition, the DEX methodology is well-suited for dealing with 'soft' decision problems, that is, less-structured and less-formalized problems that involve a great deal of expert judgment, and where scales can be more informative than quantitative scores (Rozman et al. 2009). This also holds true for the assessment of the family farm succession status where the perspectiveness of farms depends on the attributes with scales ("the interest exerted by children for agriculture," "the existence of a successor," etc.). By solving complex problems like the assessment of the perspectiveness of farms (Fennell 1981; Dežman 1988; Stiglbauer and Weis 2000), and by applying the multi-attribute method for the numerous real-life assessment examples (Rozman et al. 2009; Pavlovič et al. 2011; Bohanec et al. 2000), the DEX methodology was recognized as useful in the presented survey.

Attributes are variables which represent decision sub-problems. Their values are descriptive values, and usually represented by words rather than numbers, for example "high," "perspective," "bad," etc. In the DEXi model, each attribute is determined with its name and scale. According to their position in the model, the attributes may be basic (terminal nodes of the model) or aggregate internal nodes (Bohanec 2008). The basic attributes are inputs of the multi-attribute model and the options are described by the values of basic attributes. The attributes are connected by a utility function, which is defined by the *if-then* decision rules, instead of numerically by weights or some other kind of formula (Jereb et al. 2003). For the final assessment, the utility function

[3] Countries included in the FARMTRANSFERS database use the standardized questionnaire which aims at shedding light on international farm succession processes.

represents a knowledge base (the complete set of "what if" decision rules), which is ultimately used for the evaluation of options (Pažek et al. 2006a). In the final phase, the DEXi enables a quality verification and explanation of the results gained (Bohanec and Rajkovič 1995).
In our research, the theoretical multi-attribute DEXi model was developed first. Thirteen basic and eight aggregate factors affecting succession were defined. These factors are compatible with the model attributes and a hierarchical tree was structured in the first step. The second step was to design the set of values, and in the third step the utility functions were carried out. Afterwards, the data from the questionnaires was applied to the model for evaluation purposes. In the end, the results were analysed in more detail by using the plus-minus-1 analysis.

2.1 The Model Development and Problem Identification

The model was developed according to the principles of the DEX method. The objective was to assess 40 different farms across the Slovene Mediterranean region, and to examine how farms are distributed within five categories: unperspective, less perspective, almost perspective, perspective and very perspective. The categories describe the current succession status for each farm.

2.1.1 Attributes Identification

Thirteen basic attributes were defined according to their influence on the process of family farm succession and future of farm survival. The following list of basic attributes was identified, although many other attributes could be recognized in different literature sources (Ilak-Peršurić 2001; Glauben et al. 2004; Väre 2006): the farm size, the socio-economic farm type, on-farm specification or diversification, the number of sons on the farm family, the age of the children in the family, the interest exerted by the children for agriculture, the tradition of farming in the family, the age and education of the farm head, the farmer's intention to hand over the farm, the farmer's opinion about his profession and his way of living, the farmer's discussion about handing over the farm, and the existence of the successor on the family farm. The important limitation by attributes identification was the data source from the standardized FARMTRANSFERS questionnaire.

- The farm size

The influence of the farm size is examined widely in the literature. In general, the bigger the farm, the higher the possibility for future farm transfer and survival (Corsi 2004; Dežman 1988; Gasson et al. 1988; Glauben et al. 2004a; Glauben et al. 2004b; Hennessy and Rehman 2007; Kerbler 2007; Kimhi and Bollman 1999; Kovačič 1996; Ochoa et al. 2007; Rossier and Wyss 2007;

Stiglbauer and Weiss 2000; Väre 2006; Fennell 1981; Burton and Walford 2005).

- Socio-economic farm structure: full or part-time farm

The socio-economic farm type indicates the source of income for the family farm, which can be acquired from farming or from other sources of off-farm work. According to Kovačič (1996) four main socio-economic farm types in Slovenia exist: full-time, part-time, supplementary and aged farms. The research here was focused only on the full and part-time farm types. As stated by Stiglbauer and Weiss (2000), the part-time farmers (in comparison to full-time farmers) are significantly less likely to hand over the farm within the family, and are characterized by a higher probability of farm survival. The argument is that if the farm does not allow the farming couple to work full time on the farm, the potential successor will probably also continue to work off the farm as well. This may hamper his/her interest in taking over the farm. Corsi (2004) also warned that the interrelationships between parents, successors and off-farm work are more complicated. For example, parents with successors might mainly work off the farm because they want to leave more responsibility to the successor, while a farm owner without a successor might work mainly off the farm. The negative connection between off-farm work and the probability of succession was also given by Gasson et al. (1988). They stated that if the children have been exposed to a non-farming home and work environment, then they are less likely to follow their parents in the farming occupation.

- On-farm specialization or diversification (pluriactivity)

The scientific opinion about the influence of the on-farm specialization/diversification on succession is quite united. Stiglbauer and Weiss (2000) ascertain the positive impact of on-farm diversification on the probability of farm succession. They define the diversification as a successful strategy to reduce the risk of failure in the farm business. These findings corroborate with the study of Potter and Lobley (1992), where they found out that farmers (especially older farmers) without successors are more likely to reduce their enterprise mix in order to reduce working hours. As to Gasson and Errington (1993), pluriactivity may ease the process of succession; the successor might accumulate some capital, gain experience and exercise responsibility of his own much more in a diversified enterprise then in a specialized.

- The number of sons in the farm family

This attribute is based on the concept of primogeniture, which was first described by Gasson and Errington (1993). The concept describes three distinct elements; first, ownership is transferred to one person; second, that person is male and third, he is the first-born son. Given that, it seems that the number of sons in the family may also affect the timing and the probability of succession.

Likewise, Kimhi and Nachlieli (2001) and Glauben et al. (2004b) argued that the number of sons has a stronger effect on the probability of succession than the number of daughters. In addition, Kerbler (2007) found a strong and positive impact of the sons' number on the succession status in Slovenian mountain farms. The farm successor researches done in Slovenia (Bohak et al., 2011; 2006, Kerbler 2007; Kovačič 1996; Dežman 1988; Pinterič et al., 2006) pointed out, that in general successors are sons, only less than one third are daughters followed by other family members (e.g. sons-in-law, nephews). Furthermore, from examined literature it is evident that the number of daughters and other family members does not have statistical significant impact on probability of smooth succession and timing of succession. From that reason we include only sons as basic attribute (Figure 1) in our model, although the model is not at all fixed and could be further upgraded with additional attributes (e.g. daughters, nephews, sons-in-law) if proved reasonable.

- The age of the children and farm operator

In most cases the future successor is the child of the farm owner, which is more specific for agriculture (Blanc and Perrier-Cornet 1993). The farm succession is peculiarly problematic for the farms without children. Farm families without children may face the problem of an aggravated succession process only in the case when parents are older, e.g. over 60 years old. As for younger farmers there is always the possibility of having children at later stages.

According to Gasson and Errington (1993), in the process of socialization, which extends from birth to working at home full time, the successor developed his personality and attitudes to the family and farm life. In the next stages, he is more and more involved in home farm management, and near his forties he has enough experience to take over the farm. As stated by Ochoa et al. (2007), the age of the farm operator, and hence that of his children, has first positive and then negative effects on the probability of identifying a successor. The effect of the child's and parent's age is positive up to the father's age of 59 and up to the child's age of 39, then the effect becomes negative (Ochoa et al. 2007; Bohak 2006). Similarly it is reported by Glauben et al. (2004b), Kimhi and Nachlieli (2001) and Stiglbauer and Weiss (2000) that the probability of succession rises up to a certain age of the father (60-68 years) and possible successor, then starts falling. It may be an indication of the danger of a too late succession, as a farmer who postpones succession will have more difficulties in finding a successor within the family (Errington 1993/94). In this case, the children may have start looking for alternative employment outside of agriculture. In Slovenia, the normal retirement age is between 60 and 65 years, which is consistent with the above mentioned facts.

- The interest exerted by the children for agriculture

Farm specific knowledge creates an incentive for children to take over the farm (Corsi 2004; Rosenzweig and Wolpin 1985). The child's interest in agriculture is not a negligible factor, as Errington (1993/94) has already identified four main patterns of succession where the different stages of the successor's involvement in managerial decision-making on the "home" farm are described. In the case of the "Farmer's boy," the potential successor may spend many years working for his father and is mainly used as a source of manual labour, without his real involvement or interest in the family farm business. Thus, the successor just waits for his father's death and is totally unprepared to make good business decisions. Clearly, the blame for that situation may lie in a despotic and authoritarian father, but the child's interest in everyday activities on the family farm may persuade his father that the possible successor could be more than just a source of manpower (Errington 1993/94).

- Tradition of farming in the family farm

Tradition plays an important role in farm succession, as Barclay et al. (2007) and Lentz and Laband (1990) argued, and the choice of becoming a farmer is strongly influenced by family tradition. Glauben et al. (2004b) stated that farms that have been "in the hand" of the same family for many generations have been showing a significantly higher probability of being transferred. In another study, Glauben et al. (2004) found out that more than 60 per cent of full-time farmers in Austria, but less than 50 per cent of part-time farmers, believe in traditional family farm values.

- The education of the farm operator

The effect of this factor may be somehow ambiguous. As Corsi (2004) stated, the higher education of a farm operator implies greater skills which may entail a greater farm profitability, making farming more attractive in comparison to off-farm work for possible successors. On the other hand, more educated parents often have more educated children; this may raise the off-farm wage of the children, and therefore future successors may be more interested in some other jobs instead of staying at home and taking over the farm. Likewise, an increase in the parents' educational levels enhances their opportunity for employment outside the farming sector, and increases the possibility for a farm exit (Stiglbauer and Weiss 2000). In general, many studies (Bohak 2006; Corsi 2004; Gasson and Errington 1993; Glauben et al. 2004b) agree that the impact of higher education (even agricultural) is more negative (or at least neutral) than positive.

- The farmer's intention to hand over

This attribute is closely connected with the attributes described above. When the father holds the reins vigorously and does not even think about farm hand-over in his lifetime, the future successor may become disinterested in working and planning his future on the farm. The consequences are mostly that after the

father´s death, the successor is probably already employed elsewhere, has his own accommodations and/or his own family, and may not prefer living on the farm and running the family farm business at all (Errington 1993/94; Gasson and Errington 1993; Glauben et al. 2004b; Kimhi and Nachlieli 2001; Stiglbauer and Weiss 2000).

- The farmer's attitudes toward farming

Some studies (Barclay et al. 2007; Kerbler 2007) have confirmed that the positive attitudes (e.g., "my farm can survive in a long term view," "I am satisfied to choose farmer as a profession," "my farm is not in a difficult financial situation," "the farm shall stay in the family") of the farm operators toward farming and farm succession significantly contribute to the "smooth" farm transition. According to Glauben et al. (2004b) a farmer's closer "tie to the farm" significantly increases the likelihood of farm succession, while a negative attitude towards being a farmer significantly decreases the probability that the family farm will be transferred.

- Farm operator's discussion about handing over the farm

The successful succession requires the planned and gradual transfer (Errington 1993/94), while emotional turmoil in the farm family could lead to a failed succession (Mann 2007). The solution to the tensions created in the farm family by the critical situations of succession lies in careful planning aided by appropriate advice from outsiders (i.e. bank advisers, lawyers, farm advisers, etc.), and the discussion of these plans and purposes between family members (Gasson and Errington 1993).

- The existence of the successor

The successor is in general the child of the farmer. Farms with children are more likely to be successfully transferred than the farms without children. Nevertheless, the mere existence of children on the farms is often not enough; it is important that one child is recognized as a successor, or even educated as a successor from early childhood.

Many authors (Barclay et al. 2007; Bohak and Borec 2008; Bohak and Borec 2009; Dežman 1988; Glauben et al. 2004; Kimhi and Nachlieli 2001; Kovačič 1996; Väre 2006) agree that the presence of a successor on the farm is utterly important for the farm's viability. As confirmed by Potter and Lobley (1992; 1996), the "successor effect" may well operate throughout a whole farmer's career, and not only during his or her old age. The (non)expectation of a farm successor may have a very strong (negative) impact on the way the farm operator makes the business decisions.

2.2 The Hierarchical Tree

The attributes were structured into the hierarchical tree on the basis of their interdependence. Therefore, the main problem (perspectiveness) was

decomposed into individual, less complex sub-problems. In this way, the three aggregate attributes (internal nodes of the tree) were defined: Farm, Farmer and Successor. The aggregate attribute, Farm, is composed of 2 aggregate attributes: Estate and Family Farm. The latter one is further composed of 1 aggregate and 1 basic attribute, Children and Tradition, respectively. Furthermore, the aggregate attribute, Farmer, consists of 2 aggregate attributes, Farmer's personal characteristics and Farmer's plans and opinions. Finally, the basic attributes mentioned above represent the leaves (final nodes) of the hierarchical tree. The hierarchical model consists of 21 attributes from which 13 are basic and 8 are aggregate (Fig. 1). The final aggregate attribute, Perspectiveness, is defined also as root attribute.

Figure 1: **A hierarchical tree of the attributes**

Attribute	Description
Perspectiveness	Final evaluation of the perspectivenness of the farm.
├**Farm**	Main characteristics of the farm estate and farm family
│ ├**Estate**	Characteristics of the farm estate, linked with the farm succession process
│ │ ├size	The size (tillable areas) of the farm
│ │ ├full/part	Socio-economic farm structure: full or part time farm
│ │ └spec./diversif.	On-farm specialization or diversification
│ └**Farm family**	Characteristics of the farm family, linked with the farm succession process
│ ├**Children**	Characteristics of the children in the family, as regards their suitability for successors
│ │ ├sons	Number of sons in the farm family
│ │ ├age child.	Age of the children in the farm family
│ │ └child. inter.	The interest exerted by children in agriculture
│ └Tradition	Farming tradition in the farm family
├**Farmer**	Characteristics of the farm operator
│ ├**Pers. char.**	Personal characteristics of the farm head
│ │ ├age oper.	The age of the farm operator
│ │ └educat.	The educational level of the farm operator
│ └**Plans, opinion**	Farmer's attitudes toward farming and succession, to the future of the farm. Farm operator´s farm transfer plans and discussions.
│ ├hand over	Farmer´s intention of the farm hand over
│ ├opinion	Farmer´s opinions about his profession and his way of living
│ └discussions	Farm operator's discussion about handing over the farm
└Successor	The existence of the successor on the family farm (the successor on the farm is already identified or not)

2.3 The Definition of the Scales

Each attribute in the DEXi is defined by a scale (set of values) that is discrete and usually consists of words rather than numbers. The scales can be ordered or unordered, while ordered scales can be increasing or decreasing (Bohanec 2008). To facilitate the model development, ordered and increasing scales for each attribute were formed.

The scale for the final evaluation of each studied farm is unperspective, less perspective, almost perspective, perspective and very perspective (farm). The scales for the other attributes can be gleaned from Figure 2. The scales for each attribute were defined in accordance with the expert opinions as described previously.

Figure 2: **A set of values and scales of the attributes**

Scales

Attribute	Scale
Perspectiveness	unpersp.; less persp.; alm. persp.; persp.; v. persp.
├─**Farm**	unpersp.; less persp.; persp.; v. persp.
│ ├─**Estate**	unpersp.; less persp; persp.; v. persp.
│ │ ├─size	small (<5 ha); med. (5-10); big (>10 ha)
│ │ ├─full/part	part; full
│ │ └─spec./diversif.	spec. ; divers.
│ └─**Farm family**	unpersp.; l. persp; persp.; v. persp.
│ ├─**Children**	inapprop.; approp.; v. approp.
│ │ ├─sons	0; 1/no sons, f.o.<60; 2 or more
│ │ ├─age child.	> 40/no child.,f.o. >60; no child, f.o. <60; up to 40
│ │ └─child. inter.	no/no child, f.o. >60; undef/no-small child, f.o.<60; yes
│ └─Tradition	no; yes
├─**Farmer**	inapprop.; less approp.; approp.; v. approp.
│ ├─**Pers. char.**	inapprop.; l. approp.; approp.; v. approp.
│ │ ├─age oper.	> 65; => 65
│ │ └─educat.	high; low/mid non-agric.; low/mid agric.
│ └─**Plans, opinion**	inapporp.; less approp.; approp.; v. approp.
│ ├─hand over	no; yes
│ ├─opinion	neg.; neutr.; posit.
│ └─discussions	no one, no intention; family OR adviser/young farm operator; family AND adviser
└─Successor	not yet; probably; yes

2.4 The Utility Functions

The aggregate attributes and attributes on the lower level are connected with the utility functions. They represent the set of simple "if-then" decision rules (Vindiš et al. 2010; Pavlovič et al. 2011; Tojnko et al. 2011). For example: "*If* the estate is unperspective and the farm family is perspective or less, *then* the farm is unperspective" (Fig. 3). The asterisk "*" means any value, the sign <= means less than or equal to, and >= means equal to or better.

The definition of the utility function is based on the defined weights for different sub-attributes and on the best and the worst decision rules of different level of the hierarchical tree. This procedure was done for each level in the hierarchical tree, partial utility functions for the aggregate attributes and overall utility function for the final evaluation of the farm. The model includes 8 utility functions.

In the DEXi, the weights determination is based on linear regression or machine learning (Bohanec 2008). The weights of attributes represent the relative importance of the individual attribute on the final assessment. For example, the attributes "Farm" and "Farmer" express almost similar effects on the final assessment. In Figure 4, the local and global values of the weights of the individual criteria are shown. The difference between the local and global average weights is that the local weights represent the influence of the attributes on the aggregate attribute on the higher level. The global weights represent the influence of the attributes on the final assessment. For instance,

the aggregate attribute Farm Family has a 43 per cent impact on the attribute on the first level, Farm, and 15 per cent at the final assessment.

Figure 3: **The decision rules for evaluation of the aggregate attribute: Farm**

Decision rules

	Estate	Farm family	Farm
1	unpersp.	unpersp.	unpersp.
2	unpersp.	persp.	unpersp.
3	<=less persp	l. persp	less persp.
4	less persp	<=l. persp	less persp.
5	<=less persp	v. persp.	persp.
6	less persp	>=persp.	persp.
7	>=persp.	<=l. persp	persp.
8	v. persp.	<=persp.	persp.
9	persp.	>=persp.	v. persp.
10	>=persp.	v. persp.	v. persp.

Figure 4: **The attributes of the hierarchical tree and their weights**

Average weights

Attribute	Local	Global
Perspectiveness		
├**Farm**	35	35
│ ├**Estate**	57	20
│ │ ├size	46	9
│ │ ├full/part	41	8
│ │ └spec./diversif.	14	3
│ └**Farm family**	43	15
│ ├**Children**	79	12
│ │ ├sons	22	3
│ │ ├age child.	30	4
│ │ └child. inter.	48	6
│ └Tradition	21	3
├**Farmer**	29	29
│ ├**Pers. char.**	50	15
│ │ ├age oper.	52	8
│ │ └educat.	48	7
│ └**Plans, opinion**	50	15
│ ├hand over	37	5
│ ├opinion	32	5
│ └discussions	32	5
└Successor	36	36

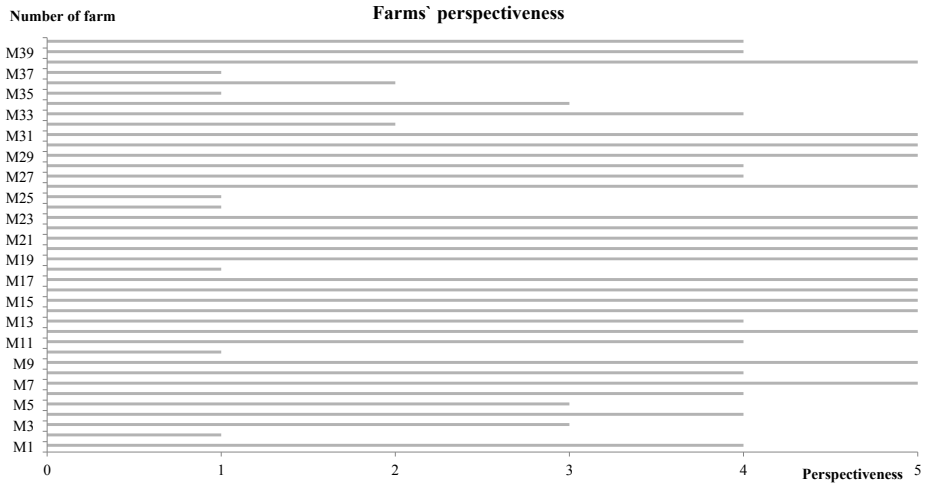
3. Results and Discussion

3. 1. Evaluation of the Farms

The computer software DEXi 3.01 evaluates each farm in a bottom-up way according to the hierarchical tree of the attributes and the corresponding utility

function. The overall evaluation (perspectiveness of the farm) is finally represented by the value of the root attribute of the model. The results are shown in Graph 1.

Graph 1: **The final evaluation of the perspectiveness of family farms (M 1 – M 40) from the Slovene Mediterranean region**



Legend: Unperspective 1; Less perspective 2; Almost perspective 3; Perspective 4; Very perspective 5

Within the sample of 40 farms 22.5 per cent of them (nine farms) received the worst evaluation: seven farms are unperspective and two are less perspective. Three of the farms are almost perspective (7.5 per cent), while the biggest crowd is represented by the best evaluated farms: 11 (27.5 per cent) are perspective and 17 (42.5 per cent) are very perspective in regard to their succession status and their possibility for a "smooth" succession process and further survival.

The results of the presented DEXi model show that the farms under scrutiny here have, in general, a good succession status. At first glance, it seems that most of these farms will survive and remain in the hands of the succeeding generation.

The best evaluated option (e. g., farm) is usually the best in so far as no bigger mistakes were made during the model development. However, the final evaluation may not provide the clearest idea about the best and the worst option(s) in general. Therefore, it is necessary to analyse the options (Bohanec and Rajkovič 1995; Jereb et al. 2003). The DEXi 3.01 software offers different analysis techniques. In order to more precisely estimate the possibilities of

farms for survival (or not), the plus-minus-1 analysis for 17 very perspective and 7 unperspective farms was also made.

3. 2. Plus-minus-1 Analysis

The impact of the modification of one attribute value on the farm perspectiveness (while the values of the other attributes are fixed) may show how each farm is vulnerable against its possible socio-economic changes in the future. In other words, how small changes and probable changes of attributes may cause an important mutation in the future farm survival. In order to estimate this vulnerability and to better evaluate if the best and the worst evaluated farms are really (not) stable regarding their survival, the plus-minus-1 analysis was performed.

Figure 5: **Plus-minus-1 analysis of farm M 12** (final evaluation: very perspective farm)

Plus-Minus-1 analysis

Attribute	-1	M 12	+1
Perspectiveness		v. persp.	
├─size		big (>10 ha)	]
├─full/part		full	]
└─spec./diversif.		[spec.	
├─sons		1/no sons, f.o.<60	
├─age child.	persp.	up to 40	]
└─child. inter.	persp.	yes	]
└─Tradition	persp.	yes	]
├─age oper.		[> 65	
└─educat.		low/mid non-agric.	
├─hand over		yes	]
├─opinion		posit.	]
└─discussions		family AND adviser	]
└─Successor	persp.	yes	]

From Figures 5 and 6 the cases for the plus-minus-1 analysis of two farms (M 12 and M 25) can be gleaned.[4] Farm M 12 belongs to the group of the best evaluated farms, while farm M 25 belongs to the worst evaluated group.

The column -1 (Fig. 5 and 6) displays the values of the attribute, Perspectiveness, where the value of each corresponding lower-level attribute changes by one step down (independently of other attributes). Likewise, the column +1 shows the effects on the final evaluation by increasing the value by one step up. The empty fields signify no effect, while the brackets denote that the attribute value cannot be decreased and/or increased.

[4] We undertook the plus-minus-1 analysis for all "the best" and "the worst" evaluated farms, but we graphically represent only two results of this analysis as the whole analysis includes 24 graphs, and detailed presentations of all of the graphs will be too complex. Therefore, the detailed plus-minus-1 analysis is presented in the text.

From Figure 5 it is apparent that the change of the basic attribute, Successor, for 1 step down (no successor on the farm) will make the final evaluation of the farm M 12 worse, from a very perspective to a perspective farm. One step up in the size of farm M 25 (from medium to big farm) will result in a much better final evaluation, an almost perspective farm (in both cases the change of one attribute is independent of other attributes).

Figure 6: **Plus-minus-1 analysis of farm M 25** (final evaluation: unperspective farm)

Plus-Minus-1 analysis

Attribute	-1	M 25	+1
Perspectiveness		unpersp.	
├─size		med. (5-10)	alm. persp.
├─full/part	[	part	alm. persp.
└─spec./diversif.	[	spec.	
├─sons		1/no sons, f.o.<60	less persp.
├─age child.		up to 40	]
└─child. inter.		undef/no-small child, f.o.<60	less persp.
└─Tradition		yes	]
├─age oper.	[	> 65	less persp.
└─educat.		low/mid agric.	]
├─hand over	[	no	
├─opinion	[	neg.	
└─discussions	[	no one, no intention	
└─Successor	[	not yet	

The plus-minus-1 analysis of the best evaluated farms shows that the change of attributes for 1 step down would only slightly change the final evaluation (from very perspective to perspective) of 70 per cent of the best evaluated farms (N=17). When analysing the other 30 per cent of the best evaluated farms (N=17), the change of attributes for one step down would cause the strongest deterioration of the final evaluation. These farms would become almost perspective, which may be an indicator that the farms are not so stable regarding their possibilities for succession and future survival.

On the other hand, 68 per cent of the unperspective farms (N=7) will get a considerably better evaluation (almost perspective farm) when the value of the attributes is changed for one step up. The other 28 per cent of the farms (N=7) will get only a little better final evaluation (less perspective farm) if the attributes change for one step up.

It is important to note that the plus-minus-1 analysis also takes into consideration the attributes which are not really "changeable," e. g. tradition in the family farm and educational level of the farm operator. Furthermore, we focused only on the 4 attributes in which changes are quite likely in the future,

and which become very important when the succession status is in question: the farm size, the socio-economic type of farm, the age of the farm operator and the presence of the successor on the farm.

The change in farm size for one step down will have no effect on 88 per cent of the very perspective farms (N=17), while the other 12 per cent of farms will get a worse final evaluation (perspective or almost perspective). The majority of the best evaluated farms are big-sized, and the change of their size into medium (one step down) is not noteworthy. In contrast, the impact of the change of farm size on the worst evaluated farms (N=7) is considerable. The majority of the worst evaluated farms are medium-sized and the change into big farms will result in a better evaluation (almost perspective) in more than 70 per cent of farms.

The influence of the socio-economic type change is substantial when the unperspective (N=7) farms are taken into consideration. The change from a part-time to full-time farm will mean a two step better final evaluation (almost perspective farm) for 70 per cent of them. While all of the best evaluated farms are full-time farms, only the change from full time to part time was possible (one step down) and the impact is insignificant: only 12 per cent of farms (N=17) will get a worse final evaluation (perspective or almost perspective) when they change their socio-economic type from a full to a part time farm.

When observing **the age of the farm operator**, we were focusing only on one step down (farmer is over 65 years old). Within the group of the best evaluated farms (N=17), the final evaluation will change from very perspective to perspective, or even almost perspective for 64 per cent of the farms (N=17) when their farm operators get older than 65. Only 28 per cent of farm operators of the worst evaluated farms (N=7) are younger than 65 years old, and the change of their age to more than 65 years will have no effect whatsoever.

Regarding the **presence/absence of the successor** on the best evaluated farms (N=17), the majority of farmers (65 per cent) stated that the successor is living on the farm, but farmers did not get the assurance that successor will take over the farm (there is a potential successor on the farm, but he is too young to be definitively appointed as a successor). To step down for them will mean that there is no successor living on the farm (or not yet defined) and in this case the final evaluation will change from a very perspective to a perspective farm. The difference is not large, but it indicates that the presence of a successor has an influence on the perspectiveness of the best evaluated farms. Among very perspective farms with a definitively defined successor, one step down (potential successor is living on the farm but he/she did not get the assurance yet that he/she will take over the farm) would change their final evaluation from very perspective to perspective, or even to almost perspective

in more than 66 per cent of the cases. Again, the presence or absence of a successor is a considerable factor.

When focusing on the worst evaluated farms, in 43 per cent of the farms (N=7) the successor is not defined, but even if he/she was appointed it would not change the final evaluation of the farms. Among the other 57 per cent of the worst evaluated farms, the successor is probably recognized, and the change for one step up (the successor is definitely recognized) will result in an unperspective changing to a less perspective farm. One step down (from probably defined successor to no successor on the farm) would have no effect.

The main conclusions from the plus-minus-1 analysis are the following: 70 per cent of the best evaluated farms (N=17) are very stable regarding their future survival. The changes (one step down) in their size and socio-economic type would not a have considerable effect, while the farm operator older than 65 years would give rise to worse final evaluations for one or two steps. Therefore, it is necessary that farmers hand over their farm in time. Another important factor is the presence/absence of a successor on the farm, as one step down would greatly worsen the final evaluation. Consequently, it is really important that the successor lives on the farm and is properly involved in the family farm business. This may also be an assurance not to lose the interest in farming and, consequently, move away from farming or chose another occupation.

Sixty-eight per cent of the worst evaluated farms (N=7) could change their final evaluation when their farm size increases, and when they shift from a part to full-time farm. The changes in successor status do not have a considerable impact, which may be an indicator that the problem of these farms is not solely due to the absence of the successor, but can also be found in other factors (i.e., the farm size, the socio-economic status of the farm, etc.).

4. Conclusions

The objective of this study was to evaluate the perspectiveness of 40 Slovene family farms from the Mediterranean region regarding their succession status. For this purpose, the multi-attribute decision DEXi model was developed, and the analysis of "the best and the worst" evaluated farms was carried out. The results of the model show that the majority of family farms from the Mediterranean region are in good hands and have quite good chances for a "smooth" succession process and future survival.

The plus-minus-1 analysis reveals that 70 per cent of the best evaluated farms would still obtain a good evaluation, even if the values of the influential attributes deteriorate. When focusing more thoroughly on the changes of certain specific attributes, the plus-minus-1 analysis has shown the following: the changes (one step down) in the size and socio-economic type would not

have a considerable effect when observing the best evaluated farms, while the change in the farm size and farm socio-economic type (from medium to big sized and from part-time to full-time farm) would imply a better situation for the majority of the worst evaluated farms. In regard to the age of the farm operator, farmers older than 65 years would imply a one or two step worse final evaluation for the best evaluated farms. The change of the successor status on the farms has an impact on the best evaluated farms: one step down would result in a perspective, or even almost perspective farm. Therefore, it is really important that the successor is living on the farm and is properly involved in the family farm business in order to ensure the farm transfer at a certain point in the future. The changes in successor status for the worst evaluated farms do not have a considerable impact, which may be an indicator that the worst evaluated farms could improve their situation in the future as the problem of their unperspectiveness lies in the factors which are "easily" changeable (i.e., the farm size and the socio-economic farm type).

The results derived from this model clearly cannot be taken generally. The changes for more than one attribute at the same time, or for more than just one step up or down, may give rise to considerable alterations in the results. The same holds true for the changes in scales and utility functions. On these grounds, we may conclude that the model developed here satisfies all the requirements set, but it could be upgraded further by applying different techniques, such as a sensitivity analysis or selective explanation, to meet the demands exerted on the part of policy makers.

The reliability of the model results of the family farm succession survey could also be confirmed by the application of the DEX model in many different research studies (Bohanec et al. 2000; Pavlovič et al. 2011,; Rozman et al. 2006; Rozman et al. 2009; Pažek et al. 2010; Pažek and Rozman 2011), although the practical added value of the developed model will be most likely recognized only after evaluation in the near future. It is also important to emphasize that the methodology applied was, for the first time, used for studies on family farms' succession status. As the results of the study are clear, reliable and understandable, it could be assumed that this method could significantly enrich the sociological knowledge of family farms in the future.

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