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DOI: 10.1016/j.anopes.2023.100057

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Research article

Sociopsychological factors underlying dairy farmers' intention to adopt succession planning



Bianca de Oliveira Müller^a, Ferenc Istvan Bánkuti^{a,*}, Geraldo Tadeu dos Santos^a,
João Augusto Rossi Borges^b, Tiago Teixeira da Silva Siqueira^c, Julio Cesar Damasceno^a

^a Department of Animal Science, State University of Maringá, Av. Colombo, 5790, bloco J45, Maringá, PR 87020-900, Brazil

^b Faculty of Administration, Accounting, and Economics, Federal University of Grande Dourados, Rua João Rosa Góes, 1761, Dourados, MS 79825-070, Brazil

^c Department of Environments & Societies, Cirad Mediterranean and Tropical Livestock Systems, Unit - SELMET, 34398 Montpellier Cedex 5, France

ARTICLE INFO

Article history:

Received 6 October 2023

Revised 4 December 2023

Accepted 5 December 2023

Handling editor: Javier Álvarez-Rodríguez

Keywords:

Dairy production
Family farming
Family succession
Rural exodus
Sustainability

ABSTRACT

Family succession is one of the most challenging problems of governance in agricultural systems in Brazil and worldwide. Dairy systems require particular attention in this regard, given their economic and social importance. Family succession necessitates a transfer plan for passing leadership over the dairy farm, usually from parents to their children. In this study, we sought to identify the influence of sociopsychological constructs of the theory of planned behavior on dairy farmers' intention to adopt succession planning. Questionnaires were administered to 160 dairy farmers in Paraná State, Brazil. Data were analyzed using correlation analysis and structural equation modeling. The results showed that social pressure – subjective norms was the construct that most influenced farmers' intention to adopt succession planning, followed by attitude toward the adoption of succession planning. Farmers' perceptions of their ability to carry out succession planning – perceived behavioral control did not influence their intention to adopt this strategy. There was a significant positive correlation of farm size and number of lactating cows with intention to adopt succession planning, indicating that large-scale farmers have a higher probability of practicing succession planning.

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Implications

We administered questionnaires to collect data regarding dairy farmers' intention to adopt succession planning. The results

showed that social pressure from individuals important to farmers was the construct that most influenced farmers' intention to adopt succession planning, followed by attitude toward the adoption of this practice. Farmers' perceptions of their ability to carry out succession planning did not influence their intention to use this strategy. There was a significant positive correlation of farm size and number of lactating cows with the intention to adopt succession planning, indicating that large-scale farmers are more likely to engage in this practice.

* Corresponding author.

E-mail address: fbankuti@uem.br (F.I. Bánkuti).

Specification table

Subject	<i>Livestock Farming Systems</i>
Type of data	Table
How data were acquired	Data were collected online. The instrument for data collection was an online questionnaire (Google Forms).
Data format	Raw data
Parameters for data collection	We administered online questionnaires to 160 dairy farmers. The data were analyzed to identify the influence of sociopsychological constructs of the theory of planned behavior on dairy farmers' intention to adopt succession planning. The sampling method was snowballing.
Description of data collection	We collected data and information about farmers' intention to adopt succession planning and structural, productive characteristics of dairy farms, and social characteristics of farmers.
Data source location	Institution: State University of Maringá City/Town/Region: Maringá, PR Country: Brazil Latitude and longitude (and GPS coordinates, if possible) for collected samples/data: 24°36'S 51°23'W
Data accessibility	The code to reproduce and analyze the data is deposited at <i>Mendeley Data Repository</i> Data identification number: https://data.mendeley.com/datasets/fsdkzzhw2w/2
Related research article	None

Introduction

Dairy production serves an important economic and social function in several countries. Worldwide, about 1 billion people depend on dairy production for subsistence, and, of these, 600 million live and work on farms (GDP, 2016). In Brazil, dairy production contributes significantly to economic and social development. Brazil ranks third in milk production around the world, with about 36.5 billion liters produced on just over 1 million dairy farms (IBGE, 2018; FAO, 2021). Dairy production is estimated to generate more than four million jobs in the country (Rocha et al., 2018). However, despite the relevance of the dairy sector, there has been a reduction in the number of dairy farms across the world (IBGE, 2018; Zou et al., 2018), a situation that could have negative economic and social impacts. The exit of farmers from the dairy activity may be related to several factors, including a lack of planning for family succession.

Family succession consists of the transference of managerial power from one individual to another, usually from parents to their children. This social process depends on a set of factors, such as preparation of the possible successor, suitability of the dairy farm, structural and productive characteristics of the farm, market and price characteristics, institutional characteristics (laws and norms), identification of the successor with the family business, and expectations and perceptions of the current manager and the successor about the future of the dairy business (Fischer and Burton, 2014; Andrade et al., 2020; Abdala et al., 2022). In addition to these fac-

tors, Andrade et al. (2020) and Rius (2017) stated that the success of family succession depends on succession planning, which is understood as the social construction of a successor to take over the family business.

Among the several methods of analysis of family succession, we chose to apply the theory of planned behavior (TPB) to identify the influence of sociopsychological constructs on dairy farmers' intention to adopt succession planning. We analyzed the structural, productive, and socioeconomic characteristics of farmers to characterize the sample and assessed correlations of these variables with the intention to adopt succession planning (Morais et al., 2018).

In this study, we started from the premise that characteristics related to dairy farmers' intentions and their perceptions of personal issues (attitude), social aspects (subjective norms), and their ability to perform an action (perceived behavioral control) can influence the decision to carry out succession planning in the dairy business. Such questions can be analyzed from the perspective of TPB, which proposes to predict and understand human behavior through analysis of the influence of individual constructs and beliefs (Ajzen, 1991). The following hypotheses were raised: (H₁) attitude has a positive influence on farmers' intention to adopt succession planning, (H₂) subjective norms have a positive influence on farmers' intention to adopt succession planning, and (H₃) perceived behavioral control has a positive influence on farmers' intention to adopt succession planning.

Material and methods

Study site

The survey was conducted in Paraná State, Brazil. Paraná stands out as the second largest milk producer in the country, with 4.6 billion liters of milk produced in 2020, accounting for 12.6% of the national production (IBGC, 2021). As in other parts of the country, dairy farms in Paraná are predominantly small-scale and operated by family labor. Dairy production represents the main source of income for these families, fulfilling an important economic and social function (IBGE, 2018). Despite being chiefly family-run and small-scale, Paraná dairy farms are highly heterogeneous in structural, productive, and technological characteristics, which is mainly attributed to the existence of important dairy basins in the southwestern region of the state (Bánkuti and Caldas, 2018; Martinelli et al., 2022).

Theoretical framework and data collection

TPB assumes that behavior is influenced by individual intention, which, in turn, is influenced by three sociopsychological constructs, namely attitude, subjective norms, and perceived behavioral control (Ajzen, 1991). From these constructs, it is possible to identify how agents make decisions and perform actions. This study used TPB constructs to assess the adoption of succession planning in dairy farms. In the context of the research, the attitude construct refers to the overall positive or negative attitude of farmers toward succession planning, subjective norms refer to farmers' perceptions of social pressure to adopt succession planning, and perceived behavioral control refers to farmers' perceptions of their own capabilities of adopting succession planning.

Data on TPB constructs and structural, productive, and socioeconomic characteristics of dairy farms were collected from 160 farmers in Paraná State. A semi-structured questionnaire containing socioeconomic, productive, and structural questions was used to characterize the sample (Table S1, Supplementary Material). Another questionnaire was used to measure TPB constructs

Table 1
Questions and scoring scale used to measure theory of planned behavior constructs in dairy farmers.

Item	Question	Possible responses (1–5)
INT1	Do you have the intention of performing succession planning in the coming years?	Definitely no–definitely yes
INT2	How strong is your intention to perform succession planning in the coming years?	Very weak–very strong
INT3	How likely are you to perform succession planning in the coming years?	Very unlikely–very likely
INT4	Do you plan to perform succession planning in the coming years?	Definitely no–definitely yes
ATT1	How good would it be for you to perform succession planning in the coming years?	Very bad–very good
ATT2	How advantageous would it be for you to perform succession planning in the coming years?	Very disadvantageous–very advantageous
ATT3	How necessary is it for you to perform succession planning in the coming years?	Very unnecessary–very necessary
ATT4	How important is it for you to perform succession planning in the coming years?	Very unimportant–very important
SN1	Do most people who are important to you think that you should perform succession planning in the coming years?	Completely disagree–completely agree
SN2	Would most people whose opinion you value approve if you were to perform succession planning in the coming years?	Very unlikely–very likely
SN3	Would most farmers who are like you perform succession planning in the coming years?	Very unlikely–very likely
PBC1	Should you wish to perform succession planning in the coming years, would you have enough knowledge?	Definitely no–definitely yes
PBC2	Should you wish to perform succession planning in the coming years, would you have sufficient resources?	Definitely no–definitely yes
PBC3	How confident are you in your ability to overcome the barriers that prevent you from performing succession planning in the coming years?	Not confident at all–completely confident
PBC4	Does your decision to perform succession planning in the coming years depend solely on yourself?	Definitely no–definitely yes
PBC5	Is the decision of whether to perform succession planning in the coming years under your control?	Definitely no–definitely yes

INT, intention construct; ATT, attitude construct; SN, subjective norm construct; PBC, perceived behavioral control construct.

(Table 1). Theoretical recommendations for the assessment of TPB constructs were followed (Ajzen, 1991), and questions were adapted from Borges et al. (2014). The TPB questionnaire comprised 16 items, 4 assessing intention (INT), 4 assessing attitude (ATT), 3 assessing subjective norms (SNs), and 5 assessing perceived behavioral control (PBC). All TPB questions were rated on a Likert scale ranging from 1 to 5, with 1 being the most negative response and 5 being the most positive one (Likert, 1932).

Initially, the study design included on-site interviews for questionnaire administration. However, the COVID-19 pandemic prevented us from having personal contact with dairy farmers. Data collection, therefore, had to be performed remotely, a change that did not prevent us from meeting the objectives of the research. The first eight dairy farmers who participated in the study had a close connection with the research team. These first applications served to validate the questionnaires and obtain the contacts of other farmers or groups of farmers who could be interested in participating in the study. The sampling method was snowballing (Takeo Yabe et al., 2015).

After the questions were validated, we created questionnaires using Google Forms and sent the link to dairy farmers through social media and a messaging app (WhatsApp). Together with

the link to the questionnaires, we sent an explanatory video recorded by the first author. In the video, the author presents herself, explains the objectives and importance of the research, and invites farmers to voluntarily participate in the study. This method of questionnaire application reduces the influence of interviewers on farmers' responses. The questionnaires were approved by the Standing Committee on Human Research Ethics at the local university (COPEP, protocol no. 50176121.3.0000.0104).

Data analysis

The first step was to perform descriptive analysis (mean, SD, maximum, and minimum values) to characterize dairy farms and farmers. For defining the intention construct, we performed a confirmatory factor analysis of input INT variables (Table 1). Factor loadings (>0.5) were used to validate the construct and Cronbach's alpha (>0.7) to assess construct reliability (Hair et al., 2009). Then, Spearman's rank correlation analysis was performed between the INT construct, structural variables (farm area and number of lactating cows), and socioeconomic variables (farmer age and experience in dairy farming). This procedure was used to assess relationships between farmers' intention to adopt succession planning, farm characteristics, and socioeconomic factors.

TPB construct data were analyzed using structural equation modeling. This method comprises two main steps: definition of the measurement model and structural modeling. To obtain the measurement model, we first performed confirmatory factor analysis using the items that compose each construct as input variables (Table 1). The measurement model was validated by calculating the average variance extracted (AVE > 50%), construct reliability (CR > 0.7), and Cronbach's alpha (>0.7) (Field, 2009; Hair et al., 2009). In addition to validity indices, we also calculated the following fit indices for the measurement model: root mean square error of approximation (RMSEA < 0.08), comparative fit index (CFI > 0.95), Tucker–Lewis index (TLI > 0.95), and standardized root mean square residual (SRMR < 0.08) (Hair et al., 2009).

After validation of the measurement model, we generated the structural model by multiple regression of model terms and constructs. Regression models were assessed using the standardized β coefficient. The goodness of fit of the structural model was analyzed using the coefficient of determination (R^2) (Hair et al., 2009).

Results

Farmers' socioeconomic and productive characteristics and correlation with intention to adopt succession planning

Of the farmers interviewed, 84.3% were men and 15.7% were women. Farmers had 42.0 ± 11.3 years of age and 17.8 ± 12.2 years of experience in dairy farming. The study population had different levels of education: 71.0% had at least high school education (12 years of formal education), 24.0% had some level of education, and 5.0% had not received formal education.

Non-participation in dairy farmers' organizations was reported by 39.4% of farmers; by contrast, 31.3% participated in production cooperatives only, 7.5% participated in milk production associations, and 21.9% participated in dairy farmers' associations and cooperatives.

The analyzed dairy farms were marked by heterogeneity. The mean production volume was 886.1 ± 1518.9 kg milk/day. The mean total farm area was 44.9 ± 64.9 ha, and the mean milk production area was 21.9 ± 27.5 ha. The mean number of lactating cows was 179.1 ± 1744.5 . Semi-confinement was the predominant production system (41.8%), followed by pasture (33.5%) and confinement (24.7%). Considering the milk production area and the

number of lactating cows, the average stocking rate was 4.23 ± 21.70 cows/ha. If we consider the different production systems, the average stocking rate for confinement was 10.49 ± 44.21 cows/ha, for the pasture and feedlot system, the stocking rate was 2.50 ± 1.63 cows/ha and for the pasture system, this rate is 1.97 ± 1.68 cows/ha.

Spearman's correlation analysis showed that INT had a positive and significant correlation with total farm area ($r = 0.20, P = 0.01$) and number of lactating cows ($r = 0.18, P = 0.02$). The other variables (farmer's age and experience in the dairy activity) did not correlate significantly with intention to adopt succession planning.

Measurement model

For validation of the measurement model, three items measuring perceived behavioral control (PBC3, PBC4, and PBC5) were excluded because of their low factor loadings. The factor loadings of the other items were assessed using a 95% confidence interval. The majority of factor loadings were above 0.7, except those of items SN3 (Would most farmers who are like you perform succession planning in the coming years?) (factor loading = 0.62) and PBC2 (Should you wish to perform succession planning in the coming years, would you have sufficient resources?) (factor loading = 0.52) (Table 2).

The average variance extracted of all constructs was greater than 50%. Construct reliability was also higher than the threshold (0.7) for all constructs, except for PBC (0.70). Cronbach's alpha values were higher than the minimum threshold (0.7); all were greater than 0.8, except that of PBC (0.67). The model had a satisfactory fit to the data (Hair et al., 2009) ($\chi^2 = 96.4; df = 58; P < 0.0001; RMSEA = 0.06; 95\% CI \text{ of } RMSEA = [0.04, 0.09]; CFI = 0.98; TLI = 0.97; SRMR = 0.03$).

Structural model

After obtaining a valid measurement model, we developed a structural model to test the hypotheses. The results of the structural model are presented in Table 3. The ATT → INT coefficient was positive and significant, indicating that H_1 (attitude has a significant positive influence on intention to adopt succession planning) was not rejected. The coefficient of SN → INT was also positive and significant, indicating that H_2 (subjective norm has a significant positive influence on intention to adopt succession planning) was also not rejected. Finally, the regression coefficient of PBC → INT was negative and non-significant, indicating that H_3 (perceived behavioral control has a positive significant influence on farmers' intention to adopt succession planning) was rejected. The coefficient values indicated that SN was the main determinant of INT, followed by ATT; PBC, however, was not a determinant of INT (Table 3). The model fit index was adequate, with $R^2 = 0.698$. This result demonstrated that ATT and SN together explain 69.8% of the variance in dairy farmers' intention to adopt succession planning.

Table 2
Standardized factor loadings, Cronbach's alpha, average variance extracted, and composite reliability of model constructs measured in dairy farmers.

Item	Construct		Construct		Construct		Construct	
Factor loading	INT1	0.90	ATT1	0.93	SN1	0.84	PBC1	0.94
	INT2	0.95	ATT2	0.93	SN2	0.84	PBC2	0.52
	INT3	0.96	ATT3	0.87	SN3	0.62		
	INT4	0.92	ATT4	0.90				
Cronbach's alpha			0.96		0.81		0.67	
AVE			0.82		0.60		0.54	
CR			0.95		0.82		0.70	

INT, intention; ATT, attitude; SN, subjective norm; PBC, perceived behavioral control; AVE, average variance extracted; CR, composite reliability.

Relationships between theory of planned behavior constructs

Dairy farmers showed a positive intent to adopt succession planning in the coming years. β values were positive for all constructs except PBC. More specifically, INT values were high, with the lowest β value being 0.90 (Fig. 1). Farmers had a strong and positive attitude, and all β values of ATT were above 0.87. The β values of SN were also high, indicating that farmers perceived a relatively high social pressure to adhere to succession planning, with the lowest β value equal to 0.62 and the highest equal to 0.84. PBC1 had a β value of 0.88 and PBC2 of 0.56.

Author's points of view

Of the 160 dairy farmers who participated in the survey, only 15.7% were women. A low participation of women as operators of rural production activities is common, as reported in several studies with dairy farmers in Brazil (Brisola, 2014; Breitenbach, 2021; Sznitowski et al., 2021; Martinelli et al., 2022). Although Arends-Kuenning et al. (2021) argued that the chances of family succession decrease when farmers do not have male children, the results of this research indicate that women's participation might increase in the future, as 33.8% of the analyzed farmers indicated that their successors would be women. In Brazil, even though the minimum retirement age for rural workers is 60 for men and 55 for women, many dairy farmers, despite having limited physical capacity for routine activities, continue in the activity for several years after retiring. Clearly, in these cases, there is a need to replace these rural workers with a successor, preferably from the same family.

The other socioeconomic characteristics, farmer age (42 ± 11.3 years), experience in dairy production (17.2 ± 12.2 years), and years of formal education (71% had at least high school education) were in agreement with the characteristics of dairy farmers in Paraná State reported in previous studies (Muller et al., 2019; Casali et al., 2020; Martinelli et al., 2022).

Studies showed that younger farmers who have had more years of education achieve better productive and economic outcomes (Zimpel et al., 2017; Bánkuti et al., 2020a; Martinelli et al., 2022) and, therefore, tend to perceive greater incentives to remain on dairy farms. We believe that agricultural succession and continuation are partly determined by advantages perceived by the youth, including financial incentives, the economic viability of milk production, and the quality of life in rural areas. We observed during our investigations that rural areas with inadequate infrastructure in terms of education, healthcare, and leisure discourage the retention of young individuals.

It was found that 60.6% of farmers participated in at least one type of farmers' association, a frequency similar to that observed among Paraná dairy farmers in previous studies (Brito et al., 2015; Casali et al., 2020; Martinelli et al., 2022). Dairy farmers' participation in collective arrangements can provide several competitive advantages that positively influence the adoption of

Table 3
Structural model results measured in dairy farmers.

Hypothesis	Relationship	Estimate	SE	95% CI LL	95% CI UL	Std. β	z	p
H ₁	ATT → INT	0.38	0.08	0.21	0.55	0.34	4.47	<0.001
H ₂	SN → INT	0.71	0.11	0.51	0.92	0.60	6.74	<0.001
H ₃	PBC → INT	-0.10	0.08	-0.26	0.06	-0.09	-1.26	0.207

H, hypothesis; INT, intention; ATT, attitude; SN, subjective norm; PBC, perceived behavioral control; LL, lower limit; UL, upper limit; Std, standard.

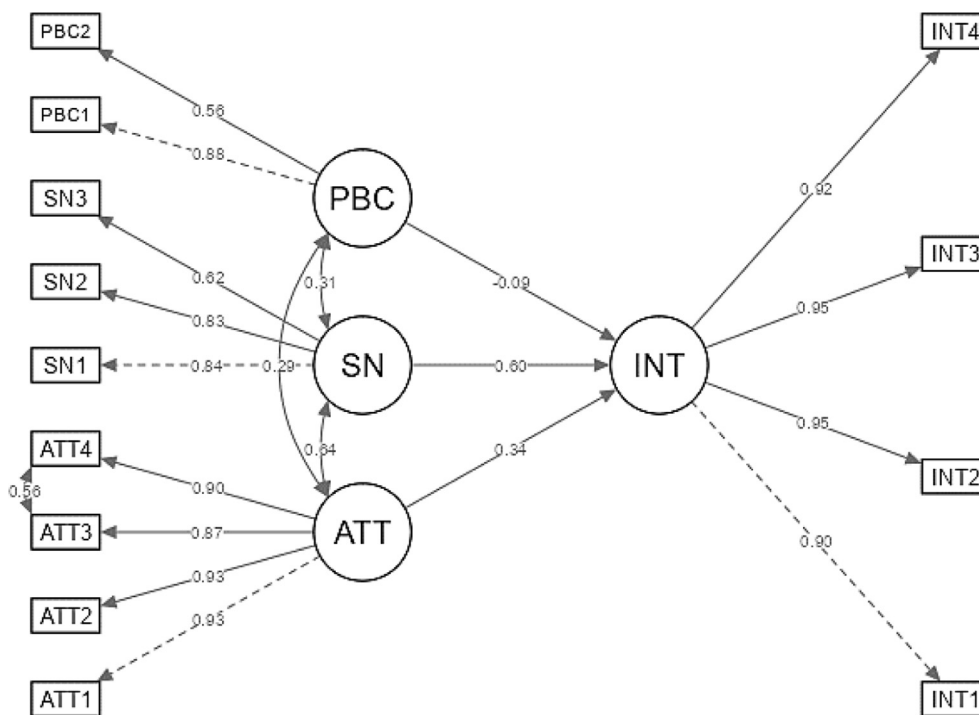


Fig. 1. Diagram of measures of intention (INT), attitude (ATT), subjective norms (SN), and perceived behavioral control (PBC) measured in dairy farmers. Rectangles represent items used to assess dairy farmers' intention to adopt succession planning in the coming years. Circles represent latent constructs. Arrows indicate dependency relationships between constructs and measured items. The values on each arrow represent β values and express the strength of relationships between items and constructs and between constructs.

succession planning. Brito et al. (2015) and Martinelli et al. (2022) argued that collective arrangements of milk production promote rural development and are strategic elements for the permanence of farmers in the activity.

Milk producers who do not participate in these forms of organization or engage in inefficient organizations face greater challenges in remaining in dairy farming (Brito et al., 2015; Martinelli et al., 2022). It should be noted that the Brazilian government has specific agencies to support small-scale dairy farmers, offering free technical assistance. However, technicians are rarely present on rural properties, and this assistance system tends to be ineffective in generating performance improvements. This inefficiency in technical interventions can also be attributed to the characteristics of dairy farms and their managers, such as limited financial capacity for investment in new technologies; low levels of education, which hinders the adoption of modern production and management tools; and a shortage of qualified labor. Another noteworthy factor is that, in Brazil, relationships between the industry and dairy farmers do not typically include the provision of technical assistance for animal nutrition, management, or other dimensions of milk production.

We observed heterogeneity in structural and productive characteristics in the analyzed dairy farms, in agreement with previous studies on dairy production in Paraná (Muller et al., 2019; Bánkuti et al., 2020b; Martinelli et al., 2022). The mean milk production (886.1 Kg/day), number of lactating cows (179.1 ± 1744.

5 animals), total farm area (44.9 ± 64.9 ha), and milk production area (21.9 ± 27.5 ha) observed in the current study were higher than those previously reported for Paraná dairy farms (Bánkuti et al., 2020b; Casali et al., 2020; Martinelli et al., 2022). This fact might be due to the presence of large-scale, technological farms in the current sample, such as those located in the dairy basin of southwestern Paraná State.

The analyzed dairy farms had semi-confinement (41.8%) as the predominant production system, followed by pasture (33.5%) and confinement (24.7%). This result might indicate a transition to high-productivity production models, as noted by Santana Silva et al. (2020). Increased productivity and, consequently, greater profitability might generate incentives for the adoption of succession planning.

Correlation analysis of INT and productive and socioeconomic variables revealed a positive and significant correlation with total farm area and number of lactating cows. In other words, dairy farmers with large properties and a high number of lactating cows are more likely to adopt succession planning. However, as underscored by Fischer and Burton (2014), the success of intergenerational transfer does not depend solely on factors related to production scale. Thus, although large-scale dairy farms have a higher probability of adopting succession strategies, production scale is not the only determining factor.

Although the correlation between the INT construct and milk production area did not yield a statistically significant result at

$P > 0.05$, we observed a positive and significant correlation at $P < 0.10$ ($P = 0.08$). A factor that might explain the stronger correlation between INT and total farm area is the view held by farmers that a larger farm area allows for the expansion of feed production. Previous studies demonstrated that on-farm feed production is a strategic approach to maintaining competitiveness, as it minimizes dependence on external feed sources and reduces associated risks (Tonet et al., 2023).

Construct analysis using TPB revealed that two constructs, ATT and SN, had a significant positive influence on dairy farmers' intention to adopt succession planning. The PCB construct had no significant influence. Of the three constructs analyzed here, SN had the greatest impact on farmers' intention to adopt succession planning in the following year. Few studies identified subjective norms as a construct with great influence on farmers' intentions (Borges et al., 2016). Most studies found attitude to be the construct with the greatest influence on intentions (Morais et al., 2018; Augusto et al., 2019; Vaz et al., 2020). Such a divergence of results might be due to the current subject of research—family succession planning—and the strong influence of individuals close to farmers, such as family members, on this decision. The high β values of items of the SN construct (Fig. 1) demonstrated that the analyzed dairy farmers believe that the support of people who are deemed important and whose opinion they value is crucial for the adoption of succession planning. These individuals are usually part of farmers' family nucleus, other rural farmers, or other members of associations and cooperatives. SN3 (Would most farmers who are like you perform succession planning in the coming years?) had the lowest β value among SN items (Fig. 1). This finding indicates that, according to the perceptions of interviewees, their peers (other farmers) were not likely to carry out succession planning. This perception may negatively influence the execution of succession planning in the analyzed dairy farms.

The strong influence of family members and other individuals on farmer's decision regarding succession planning indicates the need for greater exchange of information and debates about family succession in the study population. A family council should be developed. Family businesses that have family councils tend to have significant improvements, discuss sensitive issues more frequently, and promote more positive discussions compared with family businesses that lack this type of organization (IBGC, 2021). Given the significant influence of family members on farmers' decisions regarding the adoption of succession planning, we suggest that government and farmers' associations should design actions to foster discussions, provide guidance, and promote dialogue among rural producers and their families about the importance of developing family succession plans. Additionally, legal and administrative support should be offered for the implementation of family succession plans.

Another important factor identified in the study was the need to train successors to take over dairy farming activities. Government initiatives offer training and capacity-building programs for rural producers. However, we suggest that there is a need for improvement in these services and actions aimed at guiding succession plans, involving not only farmers but the entire family. Thus, young individuals would experience greater participation in decisions related to the dairy production system.

The ATT construct had the second greatest influence on INT, having a significant positive impact on the construct (Table 3). The items that defined ATT had high β values (Fig. 1), demonstrating that farmers believe succession planning to be good, advantageous, necessary, and important. Among the items of this construct, ATT3 had the lowest β value. This item referred to the perception that planning is necessary for family succession to occur (Fig. 1). This result can be explained, in part, by the mistaken perception of some farmers that succession planning is not impor-

tant for family succession to occur. Pessotto et al. (2019), found that, in half of the Brazilian farms analyzed, issues related to succession were not discussed, demonstrating the lack of involvement of potential successors in this process and the absence of a family council.

In the succession cycle model developed by Fischer and Burton (2014), in addition to structural and metric characteristics of the farm, the development of identification between the successor and the family business is fundamental for succession. The authors argued that progression on the "farm ladder" and the development of farm business trajectories are fundamental steps in succession planning.

Of the three constructs analyzed here, PBC was the only one to not influence INT. Perceived behavioral control allows evaluating the perceptions of farmers' ability to carry out succession planning. The stronger and more positive the perception of one's own ability, the greater the tendency to carry out succession planning. The PBC construct had the lowest β values. PBC2 (Should you wish to perform succession planning in the coming years, would you have sufficient resources?) was the item with the lowest β value (Fig. 1). Thus, the results indicated that, although farmers claimed that succession planning is advantageous (attitude construct), they consider themselves to have insufficient knowledge or resources to perform such planning. This lack of knowledge might be due to the low attention farmers give to issues related to family succession. Lima et al. (2020) reported that technical and productive issues are more frequently addressed by farmers than more delicate issues, such as those related to family succession. The lower control over this construct, evidenced here by the low attention given to this topic, can be attributed to the influence of family members or other farmers and important individuals on decision-making, as suggested by the results for subjective norms. Subjective norms had the greatest influence on farmers' intentions. Fischer and Burton (2014) underscored that, although succession depends largely on the choice of the potential successor, the current manager has great influence over succession, given that such an individual must be able to involve potential successors in production relations, thereby increasing the chances of family succession to occur.

In the current study, most farmers claimed to train their successor; however, only few considered that their successors were prepared to take over the business. This result may indicate failures in the training process or that successors are discouraged to take over the activity. Morais et al. (2018) believed that the intention of successors to take over the activity depends mainly on their positive evaluation of the transfer process.

In Paraná State, as in much of the country, there seems to be a set of obstacles that discourage succession planning in dairy farms, particularly for small-scale farmers. Among these obstacles, institutional and market demands regarding milk quality and minimum transaction volume, discourage production continuity, given that, if these demands are not met, the value of milk decreases (Bánkuti and Caldas, 2018). Furthermore, such difficulties are even greater for small-scale farmers, who rely on family labor and make little use of technologies and machinery, for example (Matte and Machado, 2016; Bánkuti et al., 2018). In this context, family succession planning is less likely.

It should be noted that, in the current study, the limited adoption of automatic milking or milk refrigeration technologies is not due to problems with energy access. Energy is available to all rural farmers in the area. The main obstacles to the adoption of production technologies, such as automatic milking and milk cooling systems, are related to equipment acquisition costs and deeply rooted cultural factors that lead farmers to adhere to the same production practices used by previous generations. The non-use of these technologies leads to a decline in milk quality, which consequently

causes challenges in transactions with the industry and results in lower market values. Thus, the economic viability of dairy production is compromised, making farms less attractive to successors. The consequence of this situation is a general sense of dissatisfaction with dairy farming, evidenced in complaints about the low price received for milk sold to the industry. This dissatisfaction is further aggravated by discontentment with the high cost of inputs.

In Brazil, the minimum price paid to farmers per liter of milk was regulated by the government until the mid-1990s. After this period, several economic sectors experienced deregulation in Brazil, including the dairy sector. With the opening of the market and the entry of foreign dairy companies into the country, milk prices began to be based on market criteria, which primarily include transaction volume and milk quality. This situation led a considerable number of farmers to abandon the dairy activity, especially small-scale farmers (Bánkuti and Caldas, 2018). Another group of small-scale farmers persists in the activity but is gradually depleting their capital over the years, discouraging family succession. Those who have successfully remained in dairy production, usually larger enterprises, are more likely to see their business grow, resulting in the concentration of Brazilian milk production, with few farmers producing on a larger scale.

Subjective norms, followed by attitude, had the greatest impact on dairy farmers' intention to adopt succession planning. Perceived behavioral control was not significant. Significant positive correlations between intention and total farm area and number of lactating cows were identified. This result demonstrates that large-scale dairy farms have a greater tendency to adopt succession planning.

Supplementary material

Supplementary material to this article can be found online at <https://doi.org/10.1016/j.anopes.2023.100057>.

Ethics approval

This study was approved by the Human Research Ethics Standing Committee of State University of Maringá, Paraná, Brazil (protocol no.4.918.544).

Declaration of Generative AI and AI-assisted technologies in the writing process

The authors did not use any artificial intelligence-assisted technologies in the writing process.

Author ORCIDs

Bianca de Oliveira Müller: <https://orcid.org/0000-0003-4192-3867>.

Ferenc Istvan Bánkuti: <https://orcid.org/0000-0003-3303-8147>.

Geraldo Tadeu dos Santos: <https://orcid.org/0000-0003-3720-5790>.

João Augusto Rossi Borges: <https://orcid.org/0000-0002-2580-051X>.

Tiago Teixeira da Silva Siqueira: <https://orcid.org/0000-0003-0285-9903>.

Julio Cesar Damasceno: <https://orcid.org/0000-0003-4002-7550>.

Author contributions

BOM: Writing original draft; Conceptualization; Methodology; Project Administration.

FIB: Writing original draft; Conceptualization; Methodology; Project Administration.

GTS: Writing original draft; Conceptualization.

JARB: Conceptualization; Methodology.

TTSS: Writing original draft; Conceptualization.

JCD: Writing original draft; Conceptualization; Methodology.

Declaration of interest

None.

Acknowledgements

The authors thank the dairy farmers, dairy industry representatives, and researchers who contributed to the study. We also thank the Brazilian Federal Agency for Support and Evaluation of Graduate Education (CAPES) for the scholarship awarded to the first author.

Financial support statement

This study was financed in part by CAPES (Finance Code 001).

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