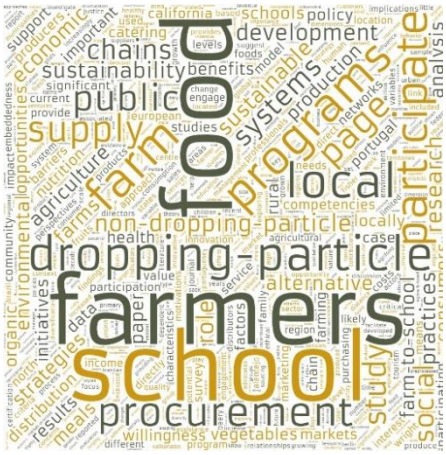
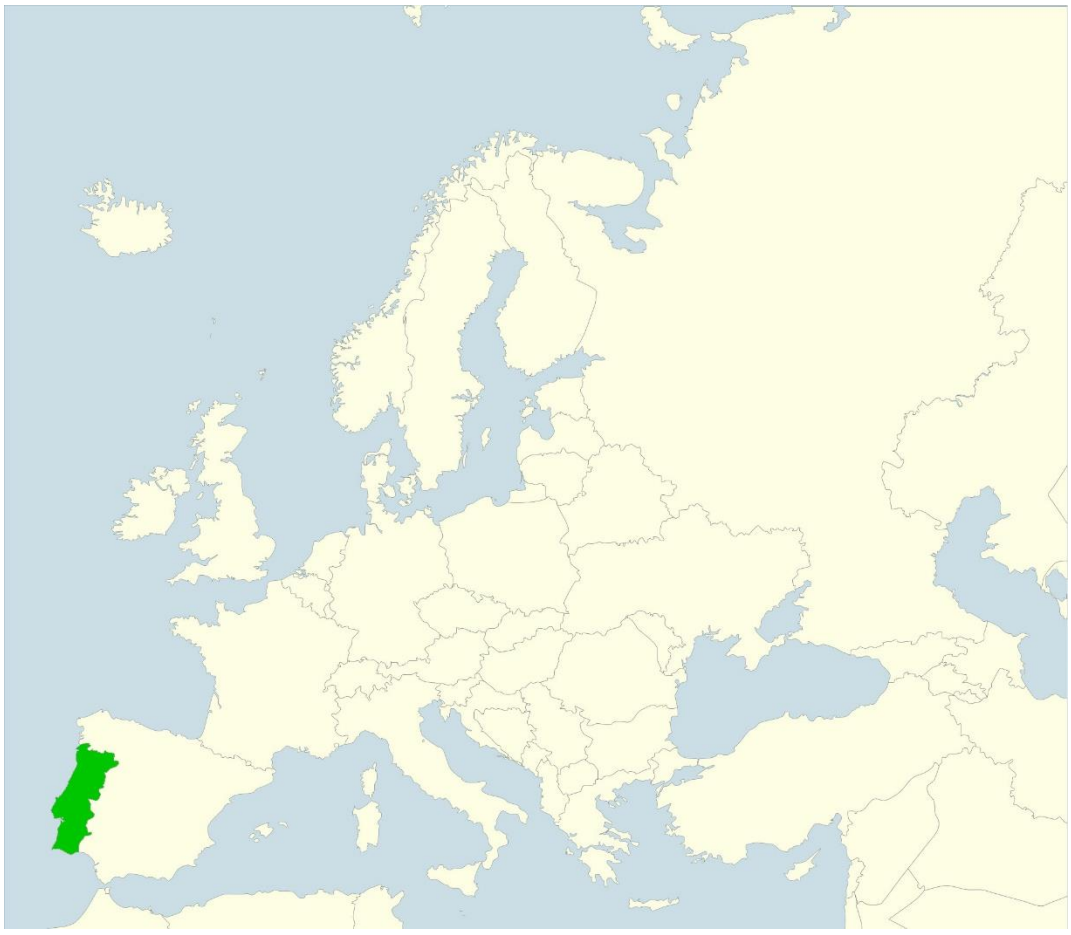
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FARM-TO-SCHOOL PROGRAMS IN PORTUGUESE LOW-DENSITY RURAL AREAS: HOW TO ENGAGE FARMERS

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Abstract: Farm to School (FTS) programs is a type of Short Food Supply Chain (SFSC) that generate new economic opportunities for farmers while enhancing communities' food security strategies, by improving the access to a safe, nutritious, and culturally acceptable diet, through a sustainable food system that maximizes self-reliance and social justice. However, the success of FTS is highly dependent on regional characteristics, and its implementation must deal with diverse views and opposing interests. In particular, farmers' willingness to engage in FTS may be affected by the need to adapt their practices to the demand of school canteens. The estimate of a logistic model is used in this study to analyse the factors that impact farmers' motivation to participate in FTS in low-density areas of Portugal, showing that market-oriented vegetable and fruit producers, living further away from the city are more likely to join FTS.

Keywords: Attitudes; Family Farming; Logit; Farm to School; Short Food Supply Chains

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Resumo: O abastecimento local de cantinas escolares é uma modalidade de Circuito Curto Agroalimentar que gera oportunidades económicas para os agricultores, ao mesmo tempo que fortalece as estratégias de segurança alimentar das comunidades, através do acesso a alimentação segura, nutritiva e culturalmente aceite, minimizando a dependência do exterior e maximizando a justiça social. No entanto, o seu sucesso depende das características de cada região e a sua implementação tem de lidar com diferentes perceções e interesses contraditórios. Em particular, o empenho dos agricultores pode ser afetado pela obrigatoriedade de adaptarem as suas práticas às exigências da procura das cantinas. Neste estudo, através da estimação de um modelo logístico, conclui-se que os produtores de frutas e hortícolas mais orientados para o mercado e residentes a maiores distâncias dos centros urbanos têm maior probabilidade de aderir a este tipo de CCA.

Palavras-chave: Agricultura Familiar; Atitudes; Abastecimento Local de Cantinas Escolares; Circuitos Curtos Agroalimentares; Logit

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Highlights

- In low density areas, Farm to School Programs can play a major role in rural vitality
- Market-oriented farmers are more willing to engage in Farm to School Programs
- Distance to the nearest city and past participation in other Short Food Supply Chains are also important drivers
- Farmers' willingness to participate in Farm to School initiatives varies across the territory.

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1. Introduction

Farm to School (FTS) is a type of short food supply chain (SFSC) in which schools purchase and feature locally produced farm fresh food, connecting schools with their local farms in an innovative effort to improve school nutrition while creating new opportunities for farmers. As farmers benefit from increased sales and higher prices, students and staff at these schools may benefit from more nutritious, appealing, seasonal and healthy meals.

School food service is a potentially huge market for farmers. In Portugal, for example, more than 25.5 million school lunches are served to children in public schools each year, resulting in government expenditure of approximately 174 million euros (in 2019), corresponding to more than 5% of Agricultural Gross Value Added (PORDATA, 2020). In this perspective, public procurement has been viewed as a means of pursuing certain public agendas relating, among other things, to the environment and social concerns.

According to Article 70 of Directive 2014/24/EU, contracting authorities may now impose special requirements on contract performance, which may include economic, innovation-related, environmental, social, or employment-related factors. This European legislation supported the 2021 reform of Portugal's Public Procurement Code, in which concerns related to the pursuit of environmental and social policies are clarified, allowing for the inclusion of short food supply chains as a requirement in school canteen procurement contracts.

The current political, regulatory, and cultural context in Portugal, as in other European countries, explicitly encourages the implementation of proactive public sector food procurement policies that prioritize local, family farming, and organic foods, in line with the European Green Deal, the Farm to Fork and the Biodiversity Strategies and the national Rural Development Programmes. In fact, over the last decade, the EU has increased its support for FTS programs, leading to a rapid proliferation of initiatives. However, in many European countries, such as Portugal, this is a recent trend and most initiatives are still in a relatively early developmental stage, being premature to evaluate their contributions to farming sustainability and rural development. In a recent survey of farm-to-school initiatives in Portugal (DGADR, 2021), eight initiatives were identified in seven different Portuguese municipalities, the first of which began in 2012.

However, as emphasized by Kleine & Brightwell (2015), it is pointless to be generous in legislation if the conditions for engaging producers are not met. If these initiatives are to be successful and long-lasting, farmers must be mobilized. Farmers, by definition, play a critical role in FTS programs, which can only be implemented if they are able and willing to participate. However, with few exceptions (Charatsari et al., 2019; Conner et al., 2012; Izumi, Wright, et al., 2010b; Mastronardi et al., 2015), the majority of the FTS literature focuses on the perspectives of school food service operations, with little attention paid to the perspectives of farmers.

As stated by Azuma & Fisher (2001), while the concept of schools purchasing their foods locally from local farmers appears to be a "win-win" opportunity, numerous logistical, administrative, and financial barriers may limit this option. An important question to be answered is how to increase farmers' participation in such initiatives. Understanding farmers' motivations and incentives for participating in FTS, as well as the barriers and opportunities they face, can help design effective programs and policies that promote and support sustainable models of local school food procurement.

In low-density areas with little attractiveness to young people, where depopulation and farm loss are especially critical, it is more difficult to generate social and economic benefits because fewer competencies and resources are available, limiting the strength of the social and economic fabric (Galliano et al., 2017). In such cases, the local context is fundamental for the sectoral system of innovation (Malerba, 2005) and FTS programs, like other types of SFSC embedded in local communities, can play an even more important role in rural vitality. Through an empirical analysis of farmers' motivations, this exploratory study, developed in four Portuguese municipalities, investigates what types of farmers are more willing to participate in FTS initiatives in low density areas, contributing to the emerging literature on public procurement of locally grown foods as a market opportunity for farmers.

We hypothesize that only certain types of farmers are motivated to overcome all the barriers and participate in school markets. Only farmers who see an economic or social benefit from selling to schools will be motivated to use distribution methods that are not commonly used in sales to other outlets (retail, direct to consumer, wholesaler, or broker). But even those who are motivated, may face constraints of various kinds (age, location, farm size) that make that option difficult.

2. Theoretical background

It is widely recognized that small and medium-sized farms not only contribute to food production but also play an important role in community vitality by providing eco-system services and improving economic and social well-being (Altieri et al., 2015; Mastronardi et al., 2015). Nevertheless, farms are disappearing at an alarming rate across the European Union countryside. Between 2005 and 2016, the number of farms decreased by about 28%, with the vast majority being farms of less than 5 hectares (Cook, 2021). Among

the reasons for this decline are the uneven development of food supply chains, increased reliance on low-cost imports, and the ongoing and growing pressure on farm incomes (Renting et al., 2003). Market access is increasingly conditioned by the ability to produce in large quantities while meeting specific criteria such as product appearance, membership in good-practice labels, and delivery flexibility. At the same time, consumer trust in globalized food chains has declined, while public concern about issues such as ecology, health, and animal welfare has increased. This combination of factors, both on the supply and demand sides, has resulted in the emergence of new food networks across Europe, including FTS initiatives (Galli & Brunori, 2013; Jones & Dailami, 2012; Laudier et al., 2013; Lehtinen, 2012; Morgan & Sonnino, 2008; Ruge & Mikkelsen, 2013). This new agri-food initiatives are presented as an opposite and alternative vision to the global food system, resulting in new food socio-ecological relationships (Allen et al., 2003).

Besides the numerous benefits of short food supply chains in general, which have been widely discussed in the literature (Gregoire & Strohbehn, 2002; Mancha & Ramírez, 2018; Mastronardi et al., 2015; Renting et al., 2003), FTS programs stand out because of their long-term impact on small farmers, local agriculture, and local economy support, as they educate a whole new generation about healthy eating habits and the benefits of purchasing locally. FTS programs incorporate nutrition-based curriculum, provide students with experiential learning opportunities such as farm visits, gardening, and recycling programs, and frequently encourage farmers to participate in activities aimed at teaching children about local food and agriculture (Azuma & Fisher, 2001; Kloppenburg & Hassanein, 2006; Morgan & Sonnino, 2006).

According to the literature (Azuma & Fisher, 2001; Conner et al., 2012; Izumi et al., 2006; Izumi, Alaimo, et al., 2010; Izumi, Wright, et al., 2010a, 2010b; Kleine & Brightwell, 2015; Kloppenburg & Hassanein, 2006; Vallianatos et al., 2004), the potential benefits of FTS can be divided into two broad categories: improved childhood nutrition and farm viability. Because the current research is primarily focused on farmers, the benefits of FTS to child nutrition will not be developed. The following are some of the most significant short- and medium-term benefits for farmers: access to stable and reliable markets that will return a fair price (able to cover at least all the production costs), and a complementary source of income; surplus product sales (perishable, limited-quantity products, or products that do not meet marketing standards); risk spreading across different types of markets; product quality enhancements that facilitate access to more profitable markets; and empowerment and social recognition.

On the other hand, small farmers who participate in FTS must address a number of concerns and challenges (Bala et al., 2008; Fitzsimmons & O'Hara, 2019; Morgan & Sonnino, 2008; Smith et al., 2016; Vallianatos et al., 2004), such as the need to comply with public sector food procurement contracts, which are typically awarded on the basis of 'best value' and 'the economically most advantageous tender' (i.e., low cost), with little or no regard for the effects of the entire agri-food cycle on human health and the environment; unfamiliarity with school invoicing, packing, and delivery requirements; difficulty in ensuring on-time deliveries; time-consuming contractual procedures outlined in public contracts and purchasing directives; difficulty maintaining a consistent supply, particularly in the absence of organized cooperatives.

In fact, farmers' goals and the needs of schools' kitchen staff do not always coincide, which can make local producers hesitant to commit as suppliers. Assistance is required to help farmers in modifying their practices to meet the needs of school food service, as well as to assist school food service in understanding the constraints under which farmers work (Izumi et al., 2006). As stated by Lehtinen (2012), meeting the needs of school kitchens would require genuine collaboration between producers and schools.

Although FTS programs have been widely framed as a market opportunity for farmers, revenue generated through school food service sales may have a minor impact on farmers' incomes (Braun et al., 2018; Izumi, Wright, et al., 2010b; Joshi & Beery, 2007). Farmers participating in FTS programs must have other motivations than price and income in such cases. Social motivations, like serving healthy foods to children and educating them on nutrition, could be significant drivers. Several authors (Goodman, 2004; Higgins et al., 2008; Ilbery & Maye, 2005; Izumi, Wright, et al., 2010a; Murdoch et al., 2000; Watts et al., 2017) believe that the distinctions between alternative and conventional agri-food systems are becoming increasingly blurred, and that farmers are likely to incorporate both into their production and marketing strategies. FTS, like other food networks, may be a pragmatic attempt by farmers to spread risk across

multiple markets in order to avoid being forced out of agriculture, rather than a shift in values and attitudes. Besides, as stated by Joshi & Beery (2007), the participation in these programs facilitates valuable connections with potential customers (parents, teachers, and community members), allowing for future sales to other institutions such as retirement homes, day-care centres and hospitals.

According to Conner et al. (2012), farmers who participate in FTS can be divided into two groups based on their motivations: market-oriented farmers and socially motivated farmers. Farmers with stronger economic motivations, according to the authors, may be more willing to incur transaction costs, such as more frequent ordering and contract negotiation, to earn revenue from school sales. Socially motivated farmers, on the other hand, are more likely to incur delivery costs to have more opportunities for interaction with students, food service professionals, and other school community members. Charatsari et al. (2018), found that farmers' willingness to participate in SFSC is higher in individuals who exhibit increased levels of citizenship behaviour, feel accepted in intra-community collaboration networks, and enjoy a sense of closeness while interacting with their community, indicating that participation in alternative food distribution schemes is not only a commercial but also a social process. The main reason for Italian farmers to join SFSC is to develop a more harmonious link with consumers, allowing them to better communicate the value of their products and build trust-based relationships with customers (Demartini et al., 2017).

3. Methodology

3.1 Data collection

The following analysis is based on a survey of 70 farmers living in low density Portuguese areas, performed with the aim of a broader research project – reLOCALiza (https://www.relocaliza.pt/) – financed by the National Rural Network. The Interministerial Coordination Commission (ICC) of 'Portugal 2020' geographical classification of low-density territories (Deliberation 55/2015) was used for this study. It is based on a multi-criteria approach that considers population density, demography, settlement, physical characteristics of the territory, socio-economic characteristics, and accessibility as indicators of low-density territories. The ICC debate sought to determine whether regions should be subject to so-called positive discrimination measures under the Portugal 2020 Partnership Agreement, signed in 2014 between the Portuguese Government and the European Commission.

To capture the diversity of low-density areas in the country, the research was applied in four municipalities across three Portuguese NUT2 regions[3] – Vila Pouca de Aguiar and Mogadouro, located in North Region, Covilhã, located in Centre Region, and Évora, located in Alentejo Region (Figure 1). The survey was conducted between September 2019 and November 2020.

[3] NUTS2 regions according to the European Nomenclature of Territorial Units for Statistics. The Portuguese mainland is divided into five NUT2 regions (North; Centre; Lisbon Metropolitan Area; Alentejo and Algarve)

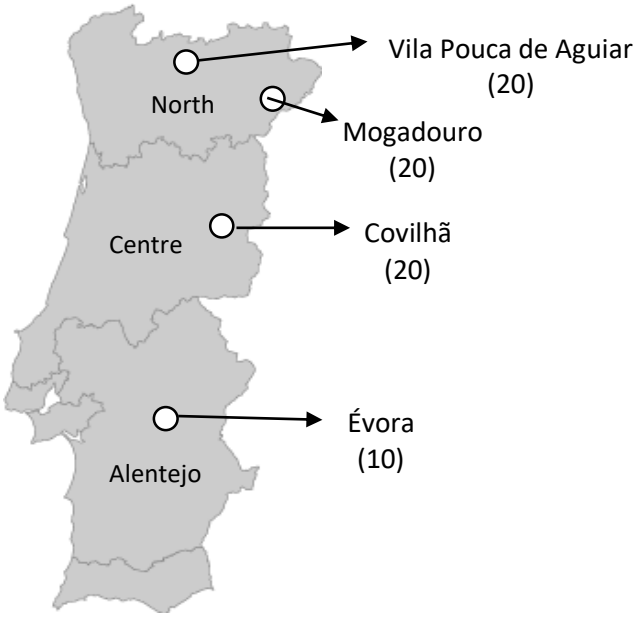


Fig 1. Location and number of questionnaires (between parentheses) by NUTS2 (North, Centre and Alentejo). Source: adapted from PORDATA

Table 1 shows some differences between the four municipalities based on a set of indicators relevant for the research. Vila Pouca de Aguiar and Mogadouro are primarily rural municipalities with a small and elderly population, where agriculture plays a significant role in employment. There are a limited number of schools and students. Covilhã and Évora, on the other hand, are more urban municipalities dominated by two major cities, with a younger and larger population. The number of schools and students is much higher, but agriculture's share of employment is much lower. Évora differs from the other three municipalities in terms of farming, with larger farms and a larger Utilized Agricultural Area.

The questionnaire was divided into four major question groups. The first set of questions was designed to obtain information about the farmer, regarding gender, age, and educational background. The second group concentrated on the farm's description, including its location, size, main products, and contribution to family income. Another group was dedicated to farmers' marketing strategies. The final set of questions attempted to gauge farmers' attitudes, motivations, and willingness to participate in future FTS initiatives.

Tab 1. Characteristics of the municipalities included in the study. Source: Statistics Portugal, 2021, 2022

	Vila Pouca de Aguiar	Mogadouro	Covilhã	Évora
Population (2021)	11812	8301	46455	53577
Total Area (Km^2)	437	761	556	1307
Population density (inhabitants/Km^2) (2021)	27.0	10.9	83.5	41.0
Average age (years) (2021)	52.2	54.1	49.2	45.5
Number of Schools (2020–2021)	11	4	57	58
Public	10	3	45	38
Private	1	1	12	20
Number of Students (2020–2021)	1257	1057	5986	9419
Public Schools	1192	649	5281	7363
Private Schools	65	408	705	2056
Employed Population in the Agriculture sector (%) (2021)	6.1	16.1	1.8	4.8
Utilised Agricultural Area (ha) (2019)	33355	17580	14338	114752
Total number of farms (2019)	3222	1788	1701	1128
Farms Average Size (ha) (2019)	10.4	9.8	8.4	101.7
Farms with less than 10 ha (%) (2019)	85.0	95.6	92.5	64.5
Farmers average age (years) (2019)	66	65	65	62

Data was gathered using a face-to-face fully structured questionnaire that lasted one to one and a half hours to allow enough time to present the questions and so assure the quality of the information gathered. The database included 70 family farmers from the four municipalities included in the study. In each municipality, twenty interviews were conducted, except for Evora, with ten (Figure 1). To ensure participation and reduce costs, questionnaires were administered using a convenience sample procedure by technical staff from local farmer associations with extensive field experience. None of the participants had ever been involved in FTS, even though 90% use or have used other SFSC modalities to sell their products, mainly direct sale in local markets. Given the limited number of participants and the fact that they were not chosen at random, the sample may not be representative, and some bias must be expected.

The main descriptive statistics on the characteristics of farms and farmers in the sample are shown in Table 2.

Tab 2. Descriptive statistics. Source: authors calculation

	Mean	S.D.	Min.	Max.
Farm features				
Location (NUT2) (*)				
North	0.571		0	1
Centre	0.286		0	1
Alentejo	0.143		0	1
Size (ha)	17.2	26.8	1	200
Percentage of family income provided by the farm (*)				
Less than 25%	0.314		0	1
25% – 50%	0.114		0	1
> 50% – 75%	0.100		0	1
> 75%	0.472		0	1
Type of Products (*)				
Fresh fruits and vegetables	0.571		0	1
Potatoes	0.286		0	1
Cereals	0.071		0	1
Olives/Olive oil	0.157		0	1
Vineyard/wine	0.071		0	1
Nuts	0.128		0	1
Cow meat (several species)	0.171		0	1
Other types of meat	0.128		0	1
Previous involvement in SFSC (*)	0.900		0	1
Manager characteristics				
Age (years)	55.1	11.6	28	80
Gender (Male) (*)	0.642		0	1
Education Level (*)				
Basic school (< 12 years)	0.701		0	1
Secondary school (12 years)	0.128		0	1
Higher Education	0.171		0	1

(*) For binary variables the mean corresponds to relative frequency; standard deviations are omitted.

3.2 Variables and Model

All the variables in the model are briefly described in Table 3. The dependent variable represents the willingness of farmers to get involved in FTS initiatives even if it means having to adjust his/her practices to the school canteens' demands. The values used in the model were assessed by asking farmers if they would be willing to engage in FTS initiatives, even if that means having to change their practices to meet the needs of school food services. The variable (*FTS*) takes the value 1 if the answer was *Yes*, and 0 otherwise.

Attitude is the primary independent variable. It was included in the model to investigate the impact of attitudes and beliefs on farmers' willingness to participate in FTS. When economic factors, such as a higher price, were stated as the most major incentive to eventually engage in FTS in the future, participants were classified as market-oriented farmers. When the farmers were classified as market-oriented, the dichotomous dependent variable *Attitude* received a value of 1, otherwise it received a value of 0.

Tab 3. Variables description.

Variable	Description
Dependent Variable	
FTS	=1 if the farmer is willing to participate in FTS (even if it means having to adjust his/her practices), and =0 otherwise
Independent variables	
Farmer attitude	
Attitude	=1 if increasing marketing channels are the primary motivators for engaging in FTS and 0 otherwise
Farm features	
North	Location: =1 if located in the NUT2 North and =0 otherwise
Centre	Location: =1 if located in the NUT2 Centre and =0 otherwise
Alentejo	Location: =1 if located in the NUT2 Alentejo and =0 otherwise.
Distance	Farm's distance from the nearest city (Km)
Income0	Source of income: =1 if the farm provides no more than 50% of the family income and =0 otherwise
Income1	Source of income: =1 if the farm provides more than 50% up to 75% of the family income and =0 otherwise
Income2	Source of income: =1 if the farm provides more than75% of the family income and =0 otherwise
Fruits/veg	Products: =1 if the farm produces fresh vegetables or fruits and =0 otherwise
Acreage	Farm size (ha)
Market Strategies	
SFSC	Type of sell: =1 if the farmer is engaged in any type of SFSC and =0 otherwise
Farmer socio-demographic characteristics	
Age *Gender*	Age of the respondent, measured in years =1 if male and =0 otherwise
Education0	=1 if the manager has not completed secondary school and =0 otherwise
Education1	=1 if the manager has completed secondary school and =0 otherwise
Education2	=1 if the manager has a university degree and =0 otherwise

Aside from beliefs and attitudes, other factors such as farm characteristics or farmers' socio-demographic characteristics may impact farmers' readiness to engage in FTS. In the model a set of independent factors was incorporated, including five farm-related variables: location, distance to the nearest city, farm contribution to family income, product type, and farm acreage. The location variable was included because empirical evidence shows that rural community characteristics have a strong impact in the decisions of rural entrepreneurs (Zasada & Piorr, 2015). The present research was conducted in three different NUT2 regions of Portugal (North, Centre and Alentejo), with very different rural contexts. Agriculture in the North region is characterized by small and very small family farms, while Alentejo is the Portuguese region with bigger farms and less family farming dominance. Although more like the North region, the Centre region exhibits transition characteristics. To account for these differences, it was necessary to express the role of local framework conditions in the willingness of farmers to engage in FTS initiatives. Therefore, a variable with three categories (*North*, *Centre*, and *Alentejo*) was included in the model. Farmers' marketing strategies and SFSC enrolment are also heavily influenced by their distance

from metropolitan centres and marketplaces (Braun et al., 2018). To account for this effect, the model incorporated the variable *Distance*, which represents the distance between the farm and the nearest city. Diversification to agricultural and/or non-agricultural enterprises, as well as pluri-activity and pluri-income, are important adaptation strategies in family farming to deal with market pressures and reduce economic risk (Calus & Van Huylenbroeck, 2010; van der Ploeg et al., 2009). As a result, the impact of farming revenue on family income may be an important factor in farmers' marketing strategy selection. When farm revenue is less important for family survival and well-being, the farmer will be more willing to take risks and try new opportunities. The categorical variable *Income* seeks to capture the effect of the family dependence on farm revenue on the farm's willingness to engage in FTS. There were three levels of consideration: *Income0* if no more than 50% of the family income is derived from the farm; *Income1* if more than 50% and up to 75% of the family income is derived from the farm; and *Income2* if more than 75% of the family income is derived from the farm. Another farm-related variable included in the model was the dichotomous variable *Fruits/veg*, which takes the value 1 if the farmer produces fresh fruits and vegetables and the value 0 otherwise. This variable was included in the model for two main reasons. First, fruits and vegetables are the most commonly purchased items in FTS programs (Braun et al., 2018; Gregoire & Strohbehn, 2002; Izumi et al., 2006), and second, fresh products are often seasonal and perishable, requiring a quick sale. Therefore, farmers who grow fresh fruits and vegetables are more likely to seek alternative and complementary sales channels. Finally, multiple studies have found that small farms are more active in direct sales than medium and large farms in several countries, including the United States (Martinez et al., 2010), France (Barry, 2012) and Canada (Mundler & Laughrea, 2016). The model considers farm size via the continuous variable Acreage, which is measured in hectares.

Regarding marketing strategies, it is expected that farmers that are currently participating in other forms of SFSC are more likely to be inspired to explore new sale possibilities, such as FTS, since they are more likely to grasp the benefits of SFSC and risk spreading across various types of markets. By adding involvement in other SFCS as a determinant of the willingness to engage in FTS activities, the variable *SFSC* allows us to assess the plausibility of this assumption. *SFCS* is a dichotomous variable in the model, with a value of 1 if the farmer is already engaging in SFSC and a value of 0 otherwise.

Several studies have discovered that socio-demographic characteristics might have an impact on entrepreneurial intentions (Douglas, 2013). Age, gender, education, and skills and competences may all have an impact on management behaviour and leadership (Lerner & Haber, 2000; Minett et al., 2009; Robinson & Sexton, 1994). Education and training can have a significant impact on an entrepreneur's practices, not only because it provides essential business skills, but also because it improves learning and networking abilities (Bosworth & Atterton, 2012), which allow for additional local connectivity, which is one of the most important ingredients for FTS initiatives. A recent study on the link between participation in SFSC and farmers' competencies (Chrysanthi Charatsari et al., 2020) revealed that willingness to participate in SFSCs is affected by the levels of farmers' competencies on issues pertaining to management, entrepreneurship, marketing, networking, and cooperation. Taking this into account, a third set of farmer-related factors (Age, Gender, and Education) was included. Age was expressed in years, Gender is a dichotomous variable that takes the value 1 for male and 0 otherwise, and education was divided into three levels (Education0, for farmers that did not complete secondary school; Education1, for farmers who completed secondary school, and Education2, for farmers who completed a university degree).

3.3 Estimation procedures

The logistic regression estimation method was used, with 95 percent confidence intervals for estimated coefficients. A logit or logistic regression is a multivariate technique for estimating the effect of each explanatory variable on the likelihood of an event (Long & Freese, 2006). Binary dependent variables have two values: 0 for a negative outcome (i.e., the farmer is unwilling to participate in FTS) and 1 for a positive outcome (i.e., the farmer is willing to engage in FTS). The probability that a farmer is willing to participate in FTS is given by the expression $\Pr(Y = 1|x) = \frac{\exp(\alpha+\beta x)}{1+\exp(\alpha+\beta x)}$, where *exp* is the base of natural logarithms, α is the constant of the equation and βx are the coefficients vector of the explanatory variables. These

models have been widely used in empirical research. Long and Freese (2006) presented in detail all the issues regarding estimation, fitting, and interpretation of regression models with binary outcomes. Stata 16 software was used to perform the estimation.

4. Results

The estimation results and the goodness of fit tests made after estimation are shown in Table 4. Marginal effects (dy/dx) for all independent variables were evaluated at their mean. The model proved to be quite stable since removing specific variables or observations did not seriously affect the value of the coefficients or changed their signal. The test of the full model against a constant, using Wald X^2, was statistically significant for $p < 0.0194$, indicating that the predictors reliably distinguished between "willingness to engage in FTS" and "no willingness to engage in FTS". Other integrity of fit test was also applied after estimation, showing no reasons to believe that the model does not fit well (Hosmer-Lemeshow $X^2 = 13.07$; Prob > $X^2 = 0.1095$)). After performing the evaluation of the logistic regression, it was possible to see that prediction success overall was 81.43%.

According to the estimates, market-oriented farmers are more likely than other farmers to participate in FTS initiatives. *Attitude* is statistically significant "p-value < 0.05" showing that farmers who prioritize the economic benefits of FTS have a 17 percent higher likelihood of engagement than other farmers.

Aside from farmers' attitudes, the following characteristics have a statistically significant influence on farmers' readiness to participate in FTS: location (*Centre* and *Alentejo*), distance to the nearest city (*Distance*), type of production (*Fruits/veg*), past participation in other SFSC (*SFSC*) and farm size (*Acreage*).

When these results are examined in greater depth, it is possible to conclude that, all else being equal, farmers from the Centre and Alentejo regions are more likely to participate in FTS than farmers from the North region, and farmers located further away from the city are also more likely to participate in FTS. The same is true for producers of fresh fruits and vegetables, who are substantially more likely to participate than other farmers. Other factors being equal, as compared to other farmers, the likelihood of a fruits and vegetable grower being willing to engage in FTS is roughly 40% greater.

Despite the lower statistical significance and contrary to our prior assumption, we can also conclude that farmers who have previously participated in SFSC activities are less likely to be interested in FTS.

Acreage is also important, but also in the opposite direction of what might be expected. In general, the larger the area, the more inclined a farmer is to participate in FTS efforts. Controlling for the other variables, the chance of a farm being ready to engage in FTS activities improves by around 1.3 percent for every hectare increase in total agricultural area.

The socio-demographic characteristics included in the model (age, gender and education) are not statistically significant in explaining motivation to engage in FTS. Probably the level of education was not a good proxy for competences, because farmers' management and networking skills may not have been captured.

Tab 4. Estimation results. Source: authors computation

Variables	dy/dx	Std. Err	z	P >|z|
Attitude**	0.1675	0.7531	2.01	0.044
Centre**	0.2072	1.0152	2.22	0.026
Alentejo**	0.2716	2.5789	2.32	0.020
Distance**	0.0262	0.0946	2.28	0.022
Income1	0.1496	1.4334	1.56	0.118
Income2	0.0933	0.8478	0.91	0.361
Fruits/veg**	0.4187	1.1418	2.54	0.011
SFSC*	-0.1318	0.9581	-1.84	0.066
Acreage***	0.0129	0.0388	2.74	0.006
Age	-0.0005	0.0352	-0,12	0.901
Gender	-0.0377	0.7492	-0.43	0.666
Education1	0.2448	0.9215	0.23	0.817
Education2	-0.2181	1.6686	-0.80	0.421
Constant	-	2.9111	-1.57	0.117

Wald $X^2 = 25.57$; Prob > $X^2 = 0.0194$
Pseudo R2 = 0.3617; Log likelihood = -27.2927
Hosmer-Lemeshow $X^2 = 13.07$; Prob > $X^2 = 0.1095$
Correctly classified: 81.43%

***p-value < 0.01; **p-value < 0.05; *p-value < 0.1

For dummy variables dy/dx represents the change in the dependent variable as a result of the discrete change from 0 to 1 in the explanatory variable.

5. Conclusion and discussion

The farmer-focused methodology applied in this study emphasizes the complexities of farmers' motivations to participate in farm to school initiatives, corroborating findings from previous research on local food markets. In particular, the results suggest that farmers showing economic motivations are more likely to adapt their production and distribution practices to meet school needs. This conclusion is consistent with the findings of Conner et al. (2012) in the United States who discovered that market-oriented farmers are more willing to invest and accept higher transaction and other distribution costs to meet FTS needs because they view schools as customers and are used to changing their practices to meet customer requirements. In a recent study in Greece (Charatsari et al., 2020), it was also found that the perception that engagement in SFSCs can increase farm income is associated with the willingness to participate in SFSCs. However as shown in the literature (Joshi & Beery, 2007; Ohmart, 2002), School food sales may have less of an impact on income than market-driven farmers expect. As a result, when engaging these farmers in FTS programs, this aspect must be made clear in order to avoid significant withdrawals during the initiative's early years. Simultaneously, alternative medium and long-term economic and noneconomic benefits must be examined. Socially motivated farmers appear to be less willing to adapt their production system to the demands of school canteens, which is consistent with Conner et al.´s (2012) finding that this type of farmer is less flexible in meeting the buyers' needs. Engaging these farmers in FTS will probably require more incentives and technical support to allow them to meet the economic realities of school canteens without too many changes in their production systems.

Another conclusion is that farmers who reside further away from urban centres and, presumably, marketplaces are more inclined to participate in FTS since their transaction and distribution costs to reach markets and customers are greater. As a result, they are more prepared to seek alternatives that may help them sell their products. In research on Berlin school meals, farmers stressed the importance of living near a market where they could charge better prices in direct selling (Braun et al., 2018).

The study's findings also show that farmers' willingness to participate in FTS initiatives varies by location, with greater willingness in the Center and Alentejo regions, highlighting the need for programs that are tailored to each territory, taking into account the characteristics and experiences of local farmers.

Farmers that sell fruits and vegetables are also more likely to participate in FTS, because they are more dependent on markets and recognize economic gains from market channel diversity. The same was noted by Oberholtzer et al. (2012) regarding farmers markets in the United States and by Craveiro et al. (2019) for a Portuguese network designed to directly commercialize baskets of locally produced fruits and vegetables to consumers.

Previous involvement in SFSC is also a predictor of willingness to commit in FTS initiatives, but in an unexpected direction. Farmers who have previously participated in SFSC are less likely to participate in FTS, according to the findings. This result is surprising given that farmers who are already involved in such alternative food chains are used to promote and sustain networks based on social engagement, reciprocal resource use, and shared benefits (Charatsari et al., 2018). It is possible that farmers involved in other SFSCs may have found alternative ways to sell their products and do not wish to pursue new opportunities that involve more bureaucracy and risk.

Regarding farm size, the results also seem to contradict the literature (Martinez et al., 2010) (Barry, 2012) (Mundler & Laughrea, 2016) by showing that smaller farmers are less willing to participate in FTS. To understand this contradiction, we must keep in mind that all the farms in our study were small and medium-sized and that really smaller farmers may be aware of the significant practical difficulties and fixed costs they would face in dealing with the logistics of meeting demand at regular intervals and on a large scale, which is one of the major problems faced by farmers in FTS programs as referred by Kleine & Brightwell (2015). Consolidation of small farmer organizations is thus critical in lowering smaller farmers' potential fixed costs related to product storage, conservation, and transportation. Small farmer cooperatives, as noted by Hernández et al.(2021) can simplify logistics by pooling the productions of several farmers into a common pool that can better fulfil the demands of a competitive market. Cooperatives and other farmer organizations can also mitigate risk, by explicitly providing forms of insurance, lowering technical or agronomic input costs and taking on some burdensome bureaucratic procedures (Bardsley & Bardsley, 2014). Local associations, local action groups, municipalities, or other local institutions can also be farmer's partners as an alternative to farmer organizations. They can also play an active role in production planning, ensuring that harvests take place within the school calendar and that the goods match the quantity, quality, and variety requirements of the school canteens. Reducing fixed costs and lessening small farmers' concerns about not being able to meet canteen product requirements and bureaucracy would likely increase their willingness to participate in FTS initiatives.

In brief, to increase the chance of success of FTS projects, it may be prudent, to begin with the farmers who are most enthusiastic to join and progressively incorporate others. Pioneers in low-density areas of Portugal would be medium-sized market-oriented fruit and vegetable producers who live far from markets and are not active in other SFSCs.

This exploratory study provides a better understanding of the motivations and constraints of farmers in low density regions to engage in FTS programs, as well as clues for technical assistance initiatives in similar areas in Portugal and other European countries. They are, however, restricted to a single non-representative sample in a particular country, making the extrapolation to other locations unwise. The validity of the research contributions to theory and practice would be considerably increased if they were replicated for larger samples of farmers in other regions. Nevertheless, these findings can help drive efforts to develop effective policies and provide technical assistance to FTS initiatives. As stated by Vallianatos et al. (2004), FTS can only achieve its key objectives through policy instruments and institutional support, whether at the school district, local government, or national government level, through a community food system approach that combines health promotion, agriculture sustainability, and land-use strategies. This was also the conclusion reached at the end of the reLOCALiza project. Several policy recommendations were outlined in a document presented to the mayors of the four municipalities involved in the study, as well as to the national government (reLOCAliza, 2021).

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