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Determining the Attitudes of Farmers Engaged in Livestock Production Towards the Contracted Production Model: An Analysis of Risks, Expectations, and Sustainability

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Abstract

The transition of small-scale farmers from traditional production methods to contract farming (CF) 22 enhances the potential for increased profits. By offering higher profits to producers, contract farming encourages greater product diversity and provides the opportunity to grow more valuable products. The primary objective of this study is to identify what kind of contract farming model producers are likely to adopt for their continued production. The Analytical Hierarchy Process (AHP) was used as a methodology in the study. In the region, 70% of producers utilize female animals for fattening purposes. It was found that 73.2% of producers lack knowledge about contract farming. In production contracts, livestock operators prioritized price guarantees at 26.4%, cash prices at 24.8%, livestock supply at 21.2%, input support at 12.5%, 30 advance payments at 10.3%, and organized production at 4.8%. If contract farming is to be implemented in the region, policymakers should prioritize price guarantees in the model, ensuring that these guarantees are not set below the market price.

Keywords: Sustainable Production**,** Contract Production, Analytical Hierarchy Process, Livestock Breeding, Policy.

INTRODUCTION

Achieving the Sustainable Development Goals (SDGs) is essential for ensuring economic growth in developing countries, preventing persistent poverty, and securing food supply chains (Ton et al., 2018; Vamuloh et al., 2020). Within the agricultural sector, particularly in countries such as Turkey, addressing these goals holds significant importance. To ensure access to safe and reliable food for a growing global population, governments have increasingly encouraged large-scale enterprises to invest in small-scale farms that operate under traditional agricultural methods (Ray et al., 2021). In this context, contract farming (CF) has emerged as a key strategy for enhancing sustainability in agriculture. Many studies emphasize that CF serves as a critical mechanism for supporting

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agricultural development in developing economies (Da Silva & Ranking, 2013; Eaton & Shepherd, 2001; Minot, 2015; Otsuka et al., 2016; Schipmann & Qaim, 2010).

The United Nations Food and Agriculture Organization (FAO) defines contract farming as agricultural production conducted under an agreement between buyers and producers that sets the conditions for the production and marketing of farm products (Jing et al., 2023). A similar definition describes CF as a commercial arrangement between firms and groups of producers (Ton et al., 2018). CF facilitates market access for small-scale farmers while improving access to essential inputs and financial credit (Da Silva & Ranking, 2013; Eaton & Shepherd, 2013). Transitioning from traditional farming to CF enables smallholder farmers to enhance earnings, diversify their product range, and cultivate higher-value crops. This transition allows them to operate at more competitive price points in global markets, fostering opportunities to compete with large-scale agribusinesses (Glover & Kusterer, 2016; Runsten, 1992; Sharma, 2014).

Private firms, as well as partnerships between corporations, governments, and non-governmental organizations (NGOs), frequently implement CF arrangements. Additionally, modern market systems necessitate greater coordination along the value chain, with CF standing out as a viable institutional framework to meet this demand (Reardon & Berdegue, 2003). Studies in developing nations have explored contract farming participation rates (Günden & Miran, 2008), as well as its impact on production and income levels. While much of the literature focuses on high-value crops such as horticulture, flowers, palm oil, and coffee (Blouin & Macchiavello, 2019; Cahyadi & Waibel, 2016; Gatto et al., 2017; Macchiavello & Morjarria, 2015; Michelson, 2013; Mishra et al., 2014; Wang et al., 2014), CF has also proven beneficial for smallholder farmers, often increasing incomes by 25-50% compared to conventional farming (Eaton, Kumar, & Kumar, 1977; Ton et al., 2018). When examining the literature, particularly studies focused on the livestock sector, Contract farming has emerged as a model that provides financial security to producers in the livestock sector, enhancing income stability and reducing market uncertainties. The literature highlights that contract farming facilitates producers' access to technology, improves animal health and welfare, and enhances product quality (Hernandez et al., 2007; Key & Runsten, 1999). For instance, a study conducted in India found that contract dairy farming reduces production costs and strengthens farmers' bargaining power, thereby increasing their income (Birthal et al., 2005). Similarly, research conducted in the Philippines demonstrated that contract pig farming improves access to veterinary services, thereby reducing animal disease prevalence (Swinnen & Maertens, 2007). However, for

this model to be effectively implemented, small-scale farmers must fully comprehend the contract terms, and price mechanisms must be transparently established (Warning & Key, 2002). These findings underscore the crucial role of contract farming in improving efficiency and sustainability in the livestock sector.

Despite its advantages, smallholder farmers may struggle to meet CF requirements due to stringent quality standards, leading corporations to favor larger-scale enterprises. Even when smallholders are encouraged to engage in CF, they remain highly vulnerable to unfavorable market conditions (Sudha, 2013). Several studies have examined the barriers preventing small-scale farmers from adopting CF, identifying key determinants such as perceived risks, access to credit and markets, expected benefits, and land tenure rights (Baker et al., 2017; Lee et al., 2016). Although smallholders contribute 28-31% of global crop production and 30-34% of the total food supply, their participation in CF remains minimal, often below 5% (Amanor, 2012; Azumah et al., 2017; IFAD, 2013; Nguyen et al., 2015; Ton et al., 2018).

The literature also examines the environmental, economic, and social implications of CF, highlighting challenges that hinder its effectiveness for small farmers. In Vietnam, for example, research indicates that while contract livestock farmers experience economic benefits, increased farming activities have also led to heightened environmental pollution (Takahashi et al., 2020). Studies analyzing CF's impact on crop diversity suggest that CF is more effective in competitive markets or production processes requiring technical expertise, such as poultry farming (Ragasa et al., 2018; Simmons et al., 2005). Additionally, research investigating CF's spillover effects on labor markets suggests that the adoption of labor-intensive technologies in contract crop production increases labor demand within contract farming households (Bellemare, 2018).

In Turkey, research on CF has primarily focused on its historical development at both global and domestic levels, the challenges small farmers face, and macro-level obstacles to CF expansion (Aydın, 2007; Pakdemirli, 2020). Regional studies have identified implementation challenges, including the fragmented nature of small farms, their lack of bargaining power, and limited awareness of how CF systems function (Konak et al., 2000). The literature also underscores that CF in the livestock sector facilitates better management of production and marketing processes, reducing uncertainties in agricultural production (Öztürk, 2020). Furthermore, this system incentivizes producers to maintain high-quality standards by enabling buyers to specify demand and quality requirements (Çelik, 2019). Consequently, CF is recognized as a crucial mechanism for

sustainable livestock production and food security. However, studies addressing the economic dimensions of CF in Turkey remain relatively scarce. Given the prominence of livestock farming in Turkey's agricultural sector, particularly in the eastern province of Erzurum, there is a pressing need to transition to a more efficient production model.

Recent sharp increases in input prices and fluctuations in meat prices have adversely affected small enterprises in Turkey. If this economic instability persists, maintaining consumer access to meat and supporting small-scale businesses to sustain production will become increasingly critical. This study aims to identify the contract farming model that livestock businesses in Erzurum would be most likely to adopt. The study's originality stems from its focus on the first application of contract farming in Turkey's livestock sector, allowing for the design of a contract model aligned with farmers' expectations and offering policy recommendations to relevant institutions and organizations.

Establishing a successful CF model in the livestock sector could provide preliminary insights for contract farming models in other agricultural branches. Given the current debate surrounding red meat imports, meeting the growing population's demand for red meat through domestic production is paramount. Importing red meat or live animals would not only fail to resolve Turkey's livestock sector challenges but could also further destabilize the industry, potentially forcing small family-run farms out of business. Therefore, the primary objective of this study is to examine how livestock producers in Erzurum can sustain production through a CF model.

MATERIALS AND METHODS

The primary data source for this study consists of responses collected from a 2023 survey conducted with 138 livestock producers across various districts of Erzurum. Secondary data were obtained from relevant online resources, FAO publications, TURKSTAT reports, and other national and international studies.

Method for Selecting the Study Population

To ensure a representative sample, districts were selected based on regional similarities within Erzurum province. The selection process incorporated the perspectives of officials from the Provincial Directorates of the Ministry of Agriculture and Forestry. The study included the following districts: Narman and Oltu from the northern region, Çat from the southern region,

Horasan, Köprüköy, and Pasinler from the eastern region, Aşkale from the western region, and Yakutiye, Palandöken, and Aziziye from the central region (Fig. 1).

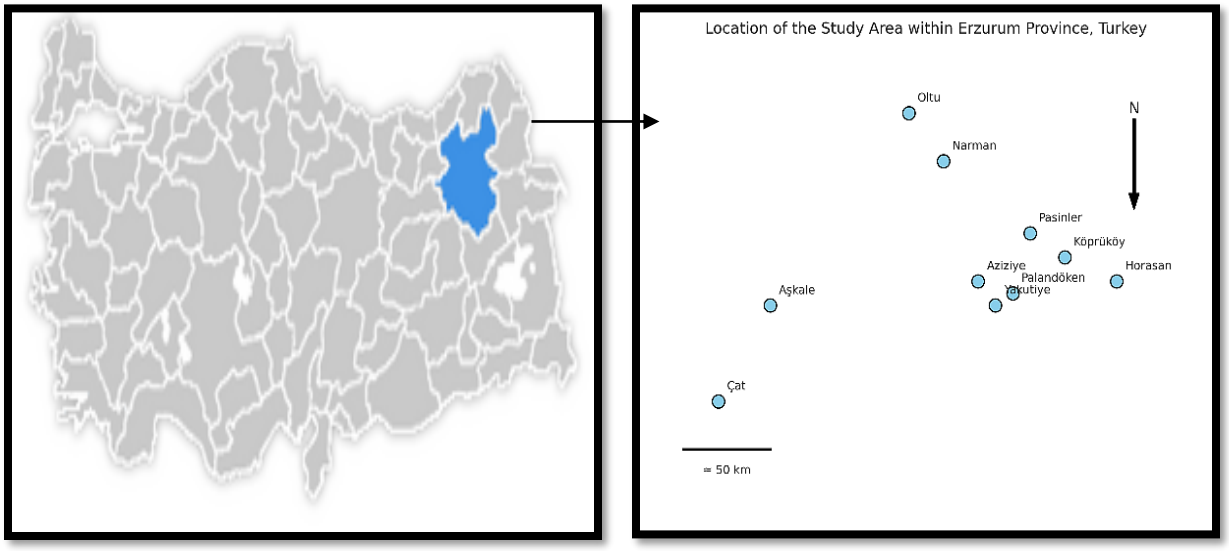

Fig.1 Description of the study areas.

Method for Determining Sample Size

This study aimed to identify the factors influencing contract farming adoption by conducting face-to-face interviews with livestock producers engaged in animal husbandry in Erzurum in 2023. To achieve this objective, the sample size was determined using the proportional sampling method. A 90% confidence interval and a 5% margin of error were applied to ensure statistical reliability. The formula used to determine the sample size is provided below (Newbold, 1995; Miran, 2010).

$$n = \frac{Np(1-p)}{(N-1)\sigma_p^2 + p(1-p)} \quad (1)$$

The variance is calculated as follows.

$$\sigma_p{}^2 = \left(\frac{r}{Z_{\alpha/2}}\right)^2 \quad (2)$$

$$\sigma_p{}^2 = \left(\frac{0.05}{1.64}\right)^2 = 0.000923$$

n: Sample size

N: Number of enterprises engaged in animal husbandry (53676)

p: The proportion of farmers who prefer contract fattening, (set as 0.15)

σ^2: Gives the variance. (0,000923)

There are a total of 53676 livestock producers in Erzurum province. With a confidence interval of 90% and an error of 5%, the sample volume was found to be 138.

Methodology for Questionnaire Design

Ensuring a conducive environment is essential for obtaining unbiased and reliable information from farmers regarding their agricultural activities. Farmers often exhibit skepticism toward inquiries from public officials and private sector representatives, which may lead to reluctance in providing accurate responses (Aksoy, 2008; Erkuş, 1997). To mitigate this issue, previous studies on the subject were carefully reviewed and incorporated into the development of the questionnaire forms.

Analytical Hierarchy Process (AHP) Method

The Analytical Hierarchy Process (AHP) was developed by Thomas L. Saaty in the 1970s as a structured decision-making framework for solving complex problems involving multiple criteria. This model is based on a hierarchical structure, wherein objectives, criteria, sub-criteria (if applicable), and alternatives are systematically organized and their interrelationships analyzed (Ballica, 2020; IFAD, 2013). The AHP methodology enables the quantification of decision-making factors by assigning percentage weights to various influencing criteria, provided that a well-defined decision hierarchy exists (Yaralıoğlu, 2001). Due to its versatility and applicability, the AHP method has been widely utilized in diverse decision-making scenarios (Vaidya, 2006).

The Analytic Hierarchy Process (AHP) is widely utilized for addressing multi-criteria decision-making problems by structuring decisions hierarchically, incorporating a goal, criteria, and alternatives. However, certain simplified implementations focus solely on pairwise comparisons of alternatives, excluding explicit criteria. These adaptations, facilitated by AHP's inherent flexibility, are particularly useful in specific decision-making contexts and are referred to as "single-level AHP" or "criterion-free AHP" (Vaidya & Kumar, 2006). In alignment with the objectives of this study, a criterion-free single-level AHP approach was adopted. The AHP model applied in this study is illustrated in Figure 2.

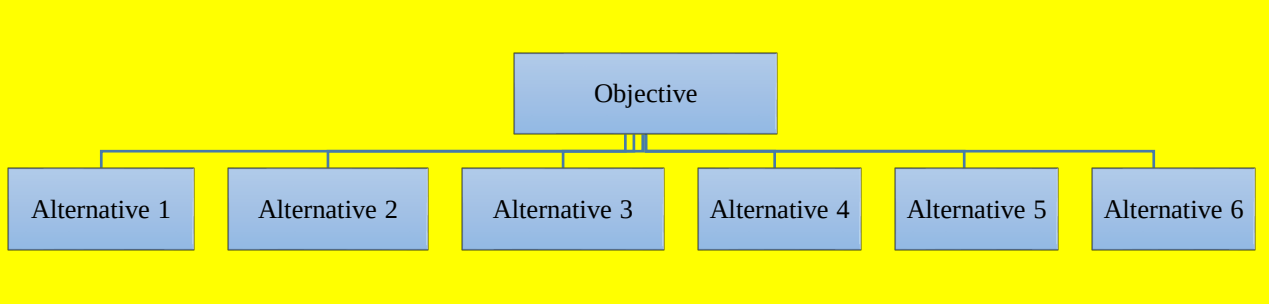

Fig. 2. A simple AHP model.

To address the decision-making problem within this study using the Analytical Hierarchy Process (AHP), the necessary steps are outlined and defined below. Each stage is accompanied by the relevant formulation and explanation:

Stage 1: Define the Decision-Making Problem

Stage 2: Comparison Matrix between Factors is created

Stage 3: Percentage importance distributions of factors are determined

Stage 4: Consistency in factor comparisons is measured

Stage 5: For each factor, the percentage importance distributions at m decision points are found

Stage 6: Find the distribution of results at decision points.

AHP provides decision-makers with an objective and structured framework for analyzing various alternatives. This method is particularly useful when evaluating multiple alternatives that must be ranked based on pairwise comparisons. In this study, six alternatives were identified as key factors influencing producer participation in the contract farming model. Since AHP is the most suitable method for making pairwise comparisons and determining the relative importance of these alternatives, it was employed as the primary decision-making approach in this research.

RESULTS and DISCUSSIONS

Descriptive Analysis Results

In agricultural enterprises, labor is one of the fundamental production factors, predominantly provided by family members. Face-to-face interviews with producers revealed that reliance on family labor is an economic necessity for managing routine daily tasks that require minimal time, particularly in livestock operations. As farm size increases, the use of external labor tends to rise alongside family labor. The average family size was calculated to be 5.44 individuals (Table 1).

A similar study on dairy farms in Erzurum reported an average family size of 5.81, with 86% of participants having social security coverage (Kılıçtek & Aksoy, 2022). Furthermore, 60% of

surveyed breeders indicated that livestock breeding was profitable; however, only 18% had received prior training related to their work.

Another study investigating the impact of contract farming on food security highlights that household resilience to food insecurity is significantly influenced by variables such as education level, asset ownership (total livestock), access to public services (e.g., microfinance services), social support, and both income and food availability (total calorie intake and farm income) (Gelata et al., 2024).

Similarly, studies have emphasized the significance of farmer and farm characteristics in contract farming participation (Kuhfuss & Subervie, 2018; Mack et al., 2020). Key factors such as gender, age, education, farming experience, and land size have been identified as critical determinants in contract farming adoption. Moreover, the research underscores the importance of demographic variables, including gender, education level, family size, and marital status, in shaping farmers' decisions to engage in contract production (Calvet et al., 2019; Kuhfuss & Subervie, 2018; Mack et al., 2020).

Table 1. Main characteristics of the operator.

Operator Characteristics	Min.	Max.	Mean
Number of family members	0	20	5.44
Marital status (Single=0, Married=1)	0	1	0.95
Registration in the animal registration system	0	1	0.93
Membership in any cooperative	0	1	0.56
Agricultural credit utilisation	0	1	0.66
Non-agricultural work	0	1	0.32
Any Social Security	0	1	0.91
Number of the family labor force	0	8	2.21
Foreign labour force	0	1	0.28
Do you think fattening is a profitable business?	0	1	0.60
Do you plan to continue fattening?	0	1	0.88
Have you received training on cattle fattening?	0	1	0.18

188 Source: Research findings.

The annual average livestock expenses of the enterprises analyzed in this study were determined to be 800,394.9 TL, while the average plant production income was recorded as 274,891 TL (Table 2).

An examination of enterprise infrastructure revealed the following distribution: manure scraper (11%), automatic waterer (76%), quarantine area (21%), and feed store (89%). Similar studies have indicated that, due to the climatic conditions of the region, nearly all barns operate within closed and connected systems. Assessing the economic and environmental impacts of these structures is

crucial for ensuring their long-term sustainability (Gibon et al., 1999; Lebacq et al., 2013; Lovarelli et al., 2020).

In alignment with the European Union's "Farm to Fork" strategy, ensuring the technological compliance of such barn structures with economic efficiency and environmental sustainability standards is of paramount importance (European Commission, 2017) (Table 2).

A range of studies examining factors that influence the success of contract farming (CF) highlights that geographical conditions, farm type, household asset accumulation, social capital availability, and firm characteristics serve as critical determinants (Barret et al., 2012; Lambrecht & Ragasa, 2018; Bellemare & Bloem, 2018). The findings emphasize the significance of assessing farm characteristics when determining farmers' willingness and capacity to engage in contract farming models.

Table 2. Basic features related to livestock enterprises.

Features related to the business	Min.	Max.	Mean
Average annual expenditure on livestock (TL)	1.000	6.200.000	800.395
Annual non-agricultural income of the enterprise (TL)	0	2.500.000	105.109
Annual income of your enterprise from crop production (TL)	0	5.000.000	274.891
Total amount of agricultural land (da)	0	5.000	212
Annual amount of support received for crop production (TL)	0	550.000	20.503
Annual amount of support received for animal production (TL)	0	200.000	9.321
Is there a manure scraper in the enterprise? (No=0, Yes=1)	0	1	0.11
Is there an automatic drinker in the enterprise? (No=0, Yes=1)	0	1	0.76
Is there a scratcher in the enterprise? (No=0, Yes=1)	0	1	0.12
Is there a quarantine area in the enterprise? (No=0, Yes=1)	0	1	0.21
Are safety measures related to diseases implemented in the enterprise? No=0, Yes=1)	0	1	0.73
Is there ventilation in the enterprise? (No=0, Yes=1)	0	1	0.95
Is technical support received for the enterprise? (No=0, Yes=1)	0	1	0.64
Do you have a feed depot? (No=0, Yes=1)	0	1	0.89
Is factory feed used? (No=0, Yes=1)	0	1	0.96
Barn type (Closed=0, Semi-open=1)	0	1	0.01
Stop type (Free stop=0, Bound=1)	0	1	0.86

Source: Research findings.

The total number of cattle in the livestock farming enterprises analyzed in this study was categorized into three strata. Among the enterprises, 34.8% fell within the first stratum (1–30 cattle), 45.6% in the second stratum (31–70 cattle), and 19.6% in the third stratum (71 and above).

Contract farming is a model that has been implemented in both developed and developing countries for many years. Evaluating and refining this model is essential to enhance its effectiveness and expansion, both globally and in Turkey (Ağır & Akbay, 2017). Within this study, it was determined that 73.2% of livestock breeders in the research area lacked knowledge about contract

farming (Table 3). Additionally, only 9.4% of the operators had prior experience with contract fattening. In contrast, a study conducted among cattle breeders in Adana province found that 39.35% of the participants were engaged in contract fattening (Ağır, 2018).

These findings highlight a significant lack of awareness regarding contract farming in the research area. Notably, 47.1% of the producers expressed a willingness to participate in contract production, indicating potential for further adoption with targeted awareness and support programs.

Table 3. General opinions of enterprise owners about contract production (%).

Business owners' level of knowledge about contract production				
	Strata 1	Strata 2	Strata 3	Mean
No.	77.1	76.2	59.3	73.2
Yes	22.9	23.8	40.7	26.8
Total	100.0	100.0	100.0	100.0
Previous contracted production status of enterprise owners				
No.	93.8	95.2	74.1	90.6
Yes	6.3	4.8	25.9	9.4
Total	100.0	100.0	100.0	100.0
Willingness of enterprise owners to make contract production				
No.	66.7	49.2	37.0	52.9
Yes	33.3	50.8	63.0	47.1
Total	100.0	100,0	100,0	100.0

Source: Research findings.

Econometric model results

Table 4 presents the descriptive statistics of the alternatives considered in contract farming, as analyzed using the AHP method. In the context of contract farming, 26.4% of livestock enterprises prioritized price guarantees, 24.8% valued advance pricing, 21.2% emphasized livestock supply, 12.5% focused on input support, 10.3% preferred advance payments, and 4.8% considered organized production as a key factor.

These findings indicate that price guarantees (26.4%) and advance pricing (24.8%) are the most critical factors influencing decision-making. The higher average values of these two alternatives compared to others suggest that enterprises prioritize these considerations in their decision-making processes. Livestock supply (21.2%) ranks third, while input support (12.5%), advance payments (10.3%), and organized production (4.8%) hold lower importance.

Furthermore, the standard deviation values highlight the variability in the importance of each criterion. Price guarantees (0.140) and livestock supply (0.139) exhibit the highest variability, whereas cash payment (0.057) shows the least variability. This suggests that while some alternatives are consistently prioritized, others vary significantly across enterprises.

This analysis provides valuable insights into the factors that enterprises prioritize under contract farming conditions. The findings emphasize the significance of price guarantees and advance pricing in the decision-making process. A similar study on farmer cooperatives highlights that none of the surveyed farmers preferred to contract with buyers, with this lack of coordination making compliance with food safety standards challenging (Jia & Huang, 2011). Likewise, a study conducted in the United States underscores how contract farming has enabled production control in the poultry, egg, and swine industries, leading to substantial improvements (Martinez, 2002). Additionally, contract farming accounts for 75% of poultry production in Brazil, 90% of cotton and milk production in Vietnam, and 50% of tea production globally (da Silva, 2013; MacDonald, 2006).

Table 4. Descriptive Statistics of AHP alternative.

Alternative	Average	Geometric Average	Harmonic Mean	Standard Deviation
Price guarantee	0.264	0.21927	0.16254	0.140
Advance Price	0.248	0.21999	0.18579	0.112
Advance payment	0.103	0.08885	0.07354	0.057
Input support	0.125	0.10298	0.08010	0.078
Organised production	0.048	0.02848	0.02291	0.076
Livestock supply	0.212	0.16226	0.11351	0.139

191 Source: Research findings

Table 5 shows the results of pairwise comparisons of alternative considered in contract manufacturing. The difference between each alternative pair was statistically evaluated using the Friedman test. Test statistic, standard error (Std. Error) and significance (Significance) values are given. It is observed that there is a significant difference between most alternative pairs. These pairs with a significance value below 0.05 show a statistically significant difference. For example, the difference between the pairs "Organized Production - Price Guarantee" (Test Statistic = 3.290, Significance = 0.000) and "Organized Production - Cash Price" (Test Statistic = 3.210, Significance = 0.000) is quite significant. However, it was observed that there was no significant difference between some alternative pairs. For example, there was no significant difference in the pair "Cash Price - Price Guarantee" (Significance = 0.723). This may indicate that these two alternative are perceived by the participants at similar levels of importance.

According to the Friedman test results given below the table, the test statistic is 309.951 and the significance value (Asymptotic Sig.) is 0.000. This result shows that there is a significant difference between the alternative in general. The highest test statistic is seen in the "Organized Production - Price Guarantee" and "Organized Production - Cash Price" pairs. This means that the difference

between these pairs is the most significant. The lowest test statistic is calculated for the "Advance Price - Price Guarantee" pair, indicating that there is almost no difference between these alternative.

These results reveal that there are significant differences between the alternative in contracted production. In particular, alternative such as price guarantee and cash price stand out and there are significant differences between organized production and some alternative. This shows that businesses attach more importance to certain alternative and that some alternative have similar values.

Table 5. Pairwise comparison results of alternative.

Alternative 1- Alternative 2	Test Statistic	Std. Error	Significance
Organised Production - Advance Payment	1.420***	0.225	0.000
Organised Production-Input Support	1.736***	0.225	0.000
Organised Production-Breeding Animal Supply	-2.518***	0.225	0.000
Organised Production - Advance Price	3.210***	0.225	0.000
Organised Production-Price Guarantee	3.290***	0.225	0.000
Advance Payment - Input Support	-0.315	0.225	0.162
Advance Payment – Livestock Supply	-1.098***	0.225	0.000
Advance Payment - Advance Price	1.790***	0.225	0.000
Advance Payment - Price Guarantee	1.870***	0.225	0.000
Input Support - Livestock Supply	-0.783	0.225	0.001
Input Support - Advance Price	1.475***	0.225	0.000
Input Support-Price Guarantee	1.554***	0.225	0.000
Livestock Supply - Advance Price	0.692***	0.225	0.002
Livestock Supply-Price Guarantee	0.772***	0.225	0.001
Advance Price-Price Guarantee	0.080	0.225	0.723
Friedman's Test Statistic = 309,951, Asymptotic Sig. (2-sided test) = 0.000			

Note: * 1%, ** 5%, * 10% indicate significance level.**

Organized production processes and price guarantees emerge as the most critical factors for farmers in adopting contract farming. These elements highlight the role of contract farming in mitigating risks and providing stability for agricultural enterprises. Over the past 15 years, research has predominantly focused on the benefits of contract farming, particularly for family-run farms.

Empirical studies suggest that farmers engaged in contract farming differ significantly from their small-scale counterparts. Several positive outcomes have been documented, including increased production efficiency (Mishra et al., 2018), enhanced food security (Jagri Binpori et al., 2021), higher earnings (Ruml & Qaim, 2021), poverty alleviation (Cahyadi & Waibel, 2016), income growth (Dubbert et al., 2023), improved output quality (Adabe et al., 2019), higher profit margins (Madani et al., 2018), and increased yields (Prasetyo et al., 2022).

Additionally, contract farming ensures consistent product quality, reduces production costs, secures access to high-quality inputs at competitive prices, and streamlines procurement processes. These advantages collectively enhance the appeal of contract farming and contribute to its increasing adoption among agricultural producers (Gelata et al., 2024).

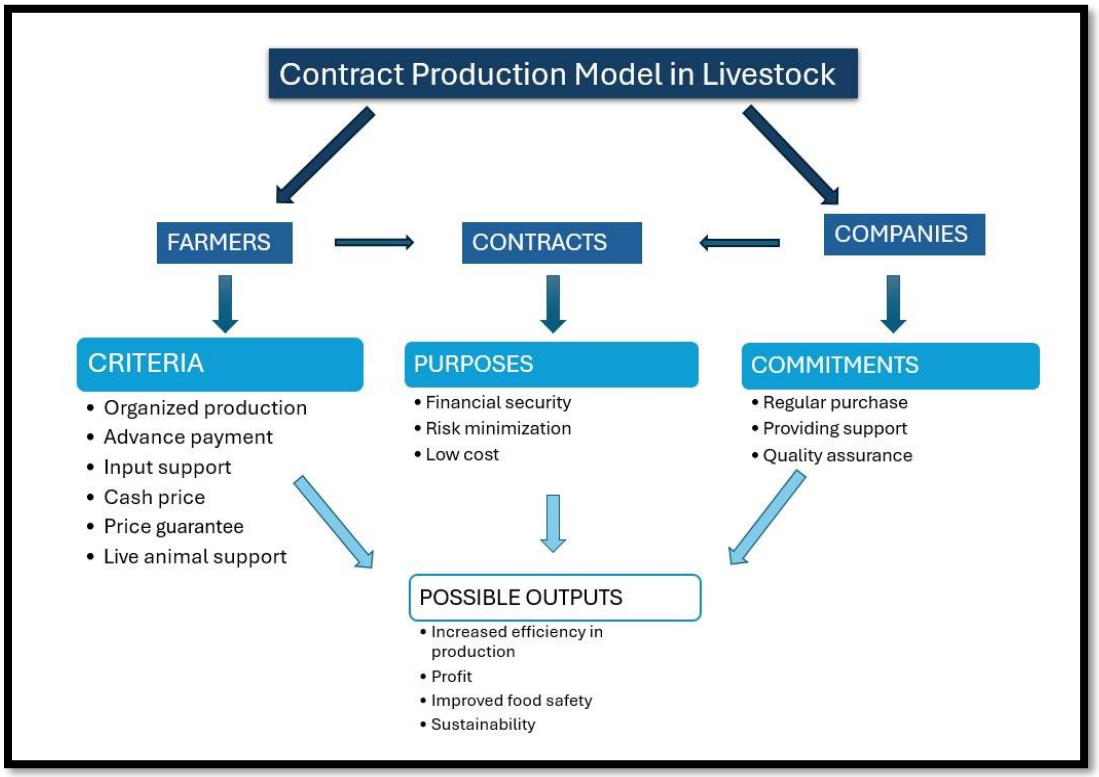

Fig 3. Estimated contract production model design as a result of the analysis.

The table resulting from this analysis summarizes the functioning of the contract production model in the livestock sector and the relationships between the parties. The table structures the interactions between farmers, companies and contracts in terms of alternative, objectives, commitments and possible outputs.

Farmers' alternative include items such as organized production, advance payment, input support, cash price, price guarantee and livestock support. These alternative help farmers stabilize the production process. The companies' commitments include regular procurement, support and quality assurance; these commitments help companies to create a sustainable supply chain. The objective of the contracts is linked to financial security, risk minimization and low cost, which creates a basis for mutual benefit for both farmers and companies.

Possible outputs of this model include increased yields, profitability, food security and sustainability. In sum, the contract production model provides financial security for both farmers and companies, supports sustainable production conditions in the sector and offers the potential to increase food security (Fig 3).

CONCLUSIONS

The findings of this study show that animal husbandry, an important sub-sector of agriculture in developing countries such as Turkey, is managed by small family businesses that are highly sensitive to economic fluctuations. These businesses face limited access to financial services and high production costs. Contract farming (CF) offers the most effective solution to protect these businesses, increase their productivity, and enable profitable production. The study revealed that 73.2% of cattle breeders in Erzurum do not have knowledge about contract farming. Among those who do, 26.4% prioritized price guarantees, 24.8% valued advance pricing, 21.2% preferred livestock procurement, 12.5% emphasized input support, 10.3% considered advance payment, and 4.8% evaluated organized production within the contract model. However, the "Contract Livestock Project" of the Ministry of Agriculture and Forestry was not successful, as it did not sufficiently align with these priorities. In this context, farmers' readiness for contract production was assessed, the alternatives they prioritized within the contract were identified, and a sample contract model was developed.

In regions where animal husbandry is the primary economic activity, implementing a specialized contract farming model could provide significant benefits. To effectively implement this model, policymakers should prioritize price guarantees above market rates to ensure income stability and should also ensure that payments are made within five business days. Adapting contract terms to local priorities in different regions will further increase the adoption and impact of the model.

Additionally, considering the ongoing decline in cattle numbers, expanding this research to other representative provinces could help policymakers develop more durable livestock support strategies.

Opportunities for Future Studies

The limited number of empirical studies conducted on this subject in Turkey presents a wide range of opportunities for future research. Future studies could focus on developing a comprehensive model for contract farming in each province, tailored to regional products or general agricultural

production. Furthermore, supporting the effects of contract farming on the production process with empirical evidence, rather than limiting studies to model design, would contribute to the creation of a more effective and sustainable structure in practice. In this regard, future research could evaluate the adaptation of the contract farming model across different product groups and farmer segments, as well as examine the financial and production performances of farmers. Such studies could provide critical data to establish contract farming as a permanent structure in the Turkish agricultural sector. Additionally, further research in this area would significantly contribute to both national and international literature on contract farming.

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