Black Sea Journal of Agriculture
doi: 10.47115/bsagriculture.1102405

Open Access Journal
e-ISSN: 2618 – 6578

Research Article
Volume 5 - Issue 4: 365-374 / October 2022

DEVELOPING SUSTAINABLE AGRICULTURE STRATEGIES: TURKISH FLORICULTURE CASE

Avni Ürem ÇÜRÜK[1]*, Sadettin Emre ALPTEKİN[2]

[1]*Adana Alparslan Türkeş Science and Technology University, Faculty of Business, Department of International Trade and Finance, 01250, Adana, Türkiye*
[2]*Galatasaray University, Faculty of Engineering and Technology, Department of Industrial Engineering, 34349 İstanbul, Türkiye*

Abstract: While Floriculture maintains its importance for many countries and cultures with its commercial possibilities, global players had to differentiate their approach to the industry because of the shift of the production towards developing countries and the change in competitive dynamics. Türkiye's slow progress in Floriculture and the inefficacy to use its potential presents a unique opportunity to develop a sustainability-oriented strategy to differentiate Türkiye from its competitors. Hence, this work focuses on Turkish floriculture industry dynamics and aims to propose sustainable strategies using a Multiple Criteria Decision Making (MCDM)-based model. A comprehensive Strength Weakness Opportunities Threats (SWOT) analysis highlighting Turkish Floriculture's current state is used for that purpose. The economic, environmental, and socio-political dimensions of sustainability in the floriculture industry are also considered via an Analytical Network Process (ANP) model. The analysis results are used to define a sustainable floriculture strategy with its benefits-opportunities and costs-risks (BOCR) merits. Based on the findings, the economic dimension of sustainability takes precedence over the other two dimensions, and an efficient floriculture strategy needs to focus on logistics and marketing in a developing country like Türkiye.

Keywords: Floriculture industry, Sustainable agriculture, ANP-BOCR, SWOT analysis

***Corresponding author:** Adana Alparslan Türkeş Science and Technology University, Faculty of Business, Department of International Trade and Finance, 01250, Adana, Türkiye
E mail: ucuruk@atu.edu.tr (A. Ü. ÇÜRÜK)
Avni Ürem ÇÜRÜK https://orcid.org/0000-0001-5637-8182
Sadettin Emre ALPTEKİN https://orcid.org/0000-0003-3555-2684

Received: April 12, 2022
Accepted: July 07, 2022
Published: October 01, 2022

Cite as: Çürük AÜ, Alptekin SE. 2022. Developing sustainable agriculture strategies: Turkish floriculture case. BSJ Agri, 5(4): 365-374.

1. Introduction

Agricultural growth triggers other sectors and contributes to rural development and community well-being. Hence, classical views see agriculture as the main gear of development and industrialization (de Janvry, 2010). Despite this significant role, agriculture has lost its importance in the literature, although theories about long-term economic development continued to evolve. More recently, the interest in agriculture within the development framework has reappeared mainly due to climate change and food availability issues experienced in the economic, socio-political, and environmental context (Clapp et al., 2018; Loizou et al., 2019; Pawlak and Kołodziejczak, 2020; Norton, 2020). This increasing interest and renewed approaches to agriculture seem to differ from classical views by focusing on sustainability.

The concept of sustainable development provides a balance between economy, society, and environment and enables a guiding conceptual framework for global, national, regional, and institutional practices (Zilberman et al., 2018). Besides, sustainable agriculture has been essential for achieving various targets for rural areas and policymakers in developing countries (Lee et al., 2006; Fan, 2020). With the renewed approach to agriculture, increasing agricultural productivity has become critical for developing countries. However, due to the lack of advanced agricultural technologies, they could not reach the level of developed countries (Aker, 2011). Although similar concepts characterize the agricultural properties of developing countries, significant differences between these countries are ignored in global and national strategy formulation processes (Mekonnen et al., 2015). Therefore, the factors affecting the differences in agricultural productivity should be understood more thoroughly. This work uses Türkiye's case to demonstrate that a country-based analysis is necessary to develop a suitable strategy for sustainable agriculture development.

Even though historically agriculture has had an important place in Türkiye's development, its role has dramatically changed with the economic growth and new economic structure. While the composition of the outputs of the agricultural sector tends towards high-value products, such as horticultural products, the sector does not significantly affect the trade as in the past (Larson et al., 2016). In this work, horticultural products, specifically floricultural products, will be examined under the sustainable development framework.

So far, for the sustainable agriculture concept, there has not been agreed on a common analytical framework that can meet the needs of policymakers and researchers in

this field (Reig-Martínez et al., 2011). In order to cope with the versatile structure of sustainability, Pannell and Schilizzi (1999) proposed the use of MCDM methods in sustainable agriculture studies. Several works (Mulder and Brent, 2006; Dantsis et al., 2010; Veisi et al., 2016; Talukder et al., 2018) have extensively addressed criteria for various aspects of sustainable agriculture, using different MCDM approaches. For Turkish agriculture, Demirel et al. (2012) proposed a model for strategy selection based on two different MCDM methods. Although there are several works on sustainable agriculture, there is no work that focuses on sustainable Floriculture and related strategies. As evaluated in the comprehensive study of Wani et al. (2018), developing countries have many restrictions and criteria in internalizing sustainable floriculture applications. We believe that this work fills this gap while introducing the floriculture industry in Türkiye.

The paper's objective is to propose sustainable development strategies for Turkish Floriculture using a comprehensive MCDM model. In line with the sustainable floriculture definition by the Floriculture Sustainability Research Coalition (Hall et al., 2009; Burnett et al., 2011; Wani et al., 2018), our proposed model also aims to reduce any change or disturbance to the environment while continuing efficiency, productivity, and economic feasibility, protecting energy and resources and therefore improving life quality and providing reliable communities.

The remainder of the paper is organized as follows: Section 2 summarizes Floriculture Industry dynamics in Türkiye. Section 3 presents the methods used in the paper and their application in Türkiye's case. In the next section, results are discussed, and a sensitivity analysis is performed. The paper is concluded in Section 5 by presenting a strategic direction for the Floriculture industry in Türkiye.

1.1. Floriculture Industry in Türkiye

Floriculture is a sub-agricultural industry that plays a vital role in the economy of many developing countries. In the global arena, countries active in the floriculture industry show an alteration in the capital, entrepreneurship, labor, and labor productivity. Climate, flower diversity, labor costs, and technological superiorities are the most critical factors that cause this differentiation. Despite the increase in distance to the primary markets and logistics costs, it is observed that the floriculture industry has switched its production stage to developing countries with high labor force and lower capital requirements (Wijnands, 2005; Muhammad et al., 2010; Gebreeyesus, 2015).

Turkish Floriculture is a young and dynamic industry compared to competing countries. According to the recent industry report by Ornamental Plants Growers Union (SÜSBİR, 2020); despite having significant advantages such as its ecology and natural resources, suitable climatic and geographical conditions, proximity to market countries, and low-cost labor, Turkish Floriculture cannot get a sufficient share from the global floriculture market.

As shown in Table 1, while the Netherlands has almost 50% of the market share, the cumulative market share of the other four countries with the highest export ranks is almost 20%. Türkiye has the 23rd rank, with a 0.5% market share, which indicates that Türkiye cannot sufficiently use the advantage of being close to the market. In addition to these data, a significant decrease in imports and increase in exports since 2017 has been observed for Turkish Floriculture, shows that the trade deficit has turned into a trade surplus for the industry (ITC, 2021).

The production areas of the industry mainly consist of fragmented small lands, and the most important domestic market is still public procurement. In addition, due to marketing and logistics problems, it is preferred to establish businesses close to settlements. This makes it difficult to acquire land and results in high prices (SÜSBİR, 2020). Table 2 shows the floricultural production areas and yield figures that have been increasing each year since 2015. However, according to SÜSBİR (2020), this increase is quite limited, and the industry needs more production areas to reach its target.

Table 1. Top exporter countries list in floricultural products (ITC, 2021)

Rank 2020	Exporter countries	Value exported in 2020 (USD thousand)	Trade balance in 2020 (USD thousand)	Annual growth in value between 2016-2020	Share in world exports	Average distance of importing countries (km)
1	Netherlands	10963628	8371042	3%	49.33%	1239
2	Colombia	1431333	1393120	2%	6.44%	5175
3	Italy	1034440	497213	5%	4.65%	1240
4	Germany	1004208	-1947128	1%	4.52%	619
5	Ecuador	845741	824235	1%	3.81%	8383
…	…	…	…	…	…	…
23	Türkiye	106768	65269	8%	0.48%	2285
-	World	22225999	2572789	3%	100%	2314

Table 2. Sowed area and production numbers in Turkish floriculture (TUIK, 2021)

Ornamental plants (2015-2020)	Year	Flowers bulbs	Indoor ornamental plants	Outdoor ornamental plants	Cut flowers	Total
Area sown (m^2)	2015	612585	1465383	32293087	11826160	46197215
	2016	597305	1312793	34877416	12014172	48801686
	2017	426885	1650710	36263071	11748365	50089031
	2018	493930	2081527	37306970	11920217	51802644
	2019	412145	1992021	37699087	12374109	52477362
	2020	498830	1706388	39739347	12183481	54128046
Production (Number)	2015	27200330	40810719	451142538	1036147373	1555300960
	2016	25337330	38150927	409239917	1041173195	1513901369
	2017	21833825	56049665	490559391	1050584960	1619027841
	2018	88657000	60149981	507183040	1055783642	1711773663
	2019	62537229	51669029	510558039	1093333943	1718098240
	2020	71415654	48458815	529109699	1012465237	1661449405

The industry is foreign-dependent on production inputs. Relatedly, the fact that the increase in product prices does not meet the cost increase in production reduces the industry's profitability each year. The number of research and researchers on floricultural products in Türkiye is insufficient. Almost all of the R&D studies that are the foremost tool to reduce foreign dependency are carried out in research institutes affiliated with public institutions and organizations. In addition, informality continues to be one of the industry's most critical problems. With all its pros and cons, the existence of problems in terms of sustainability has been revealed by using the most up-to-date reports and data for the industry. Therefore, there is a need for studies involving different perspectives and approaches to support the industry at the national and international levels.

2. Materials and Methods

Ensuring sustainable development requires a deep understanding of the characteristics of the Turkish floriculture industry. For this, we performed a SWOT analysis. The results are consolidated from local studies related to Turkish Floriculture (Zencirkiran and Gürbüz, 2009; Baris and Uslu, 2009), policy documents (GTHB 2017; TÜSSİDE 2017), and expert opinions. Four different strategy processes are used in the Threats, Opportunities, Weaknesses, and Strengths (TOWS) matrix: WT: Minimize both weaknesses and threats, WO: Minimize the weaknesses and maximize the opportunities, ST: Maximize strengths to deal with threats, and SO: Maximize both strengths and opportunities (Weihrich, 1982). Table 3 and Table 4 represent SWOT analysis and TOWS matrix, respectively.

As SWOT and, similarly, TOWS analysis may not tell the expected consequences of future adverse developments, we applied BOCR analysis to consider all the potential aspects of factors and their relationships. BOCR analysis can be defined as a decision-making tool derived from benefit-cost analysis and is very similar to SWOT in many respects (Wijnmalen, 2007). Usually, ANP is also used with BOCR to handle the merits of a decision and represent them as separate networks. This approach, shortened as ANP-BOCR, provides an in-depth analysis of a decision's positive (B-O) and negative (C-R) aspects and synthesizes the decision alternatives through the help of strategic criteria. Strategic criteria are the main criteria for evaluating the BOCR values of all decisions, reflecting the organization's objectives to be fulfilled (Saaty, 2004).

3.1 ANP-BOCR Model for Turkish Floriculture

The first layer, i.e., the upper-level network, includes the control hierarchy in which the goal node, the strategic criteria, and the BOCR merits are presented. For example, we identified the goal node of our decision problem as: 'Evaluate sustainable development strategies for the Turkish floriculture industry. Accordingly, we have created three strategic criteria based on the sustainable development concept:

- Ensuring economic sustainability in the Turkish floriculture industry.
- Ensuring environmental sustainability in the Turkish floriculture industry.
- Ensuring socio-political sustainability in the Turkish floriculture industry.

The second layer, i.e., the decision networks, includes clusters and alternative strategies. Determining the alternatives for our selection problem, we used the SWOT analysis and TOWS matrix results. The strategies are gathered under four main alternatives to make the model more applicable.

- ST1: Establish an auction system and an efficient logistics network peculiar to the floriculture industry.
- ST2: Make investments to meet world standards in production systems and product diversity.
- ST3: Implement internal regulations to increase the competitive power of the industry.
- ST4: Restructuring the industry with R&D and educational revolution.

Table 3. SWOT analysis of Turkish floriculture industry

Strengths	Weaknesses
S1. Existence of natural resources	W1. Inadequate product variety and import dependence in seeds
S2. Various climatic characteristics which enable product differentiation	W2. Inadequate production and logistics infrastructure
S3. Areas that can be allocated to floricultural production	W3. High technology and input costs due to external dependence
S4. High production quality in specific products	W4. Lack of an auction system for export
S5. Richness in endemic species	W5. Weak consumption in the domestic market
S6. A certain level of production and development	W6. As yet unpublished quality standards
S7. High added value in the unit/area ratio	W7. Misapplication of agricultural spraying and irrigation
S8. Low-cost agricultural labor	W8. Insufficiently qualified personnel and intermediate staff
S9. Existence of occupational organizations	W9. Unfair competition, high informal production, and middleman commission
S10. Existence of industrial laws and sub-legislations	W10. Capital inadequacy and financing problems
Opportunities	**Threats**
O1. Appropriate geographic location	T1. Patent rights
O2. A downward trend in floricultural production in Europe	T2. Uncertainty and fluctuation in demand
O3. Availability of various transportation types	T3. Time-consuming custom bureau procedures
O4. New logistic related initiatives	T4. New trade routes that bypass Türkiye
O5. Presence of unsaturated foreign markets	T5. High electricity and water tariffs with insufficient fertilizer and fuel support
O6. Increasing importance on landscaping in the domestic market	T6. Insufficiencies in inspection
O7. Youth bulge	T7. Türkiye's narrow point of view on R&D activities
O8. Sufficient amount of educational institutions	T8. Political instability followed by high tax and exchange rates
O9. Stability of family-owned businesses	T9. Global warming, seasonal differentiation
O10. Ongoing European Union (EU) negotiations	T10. Low willingness to accept sustainable practices

Table 4. TOWS matrix of Turkish floriculture industry

[ST]1: Advance the existing development in production with sustainability studies and spread it to the whole product portfolio (S6-S4-S2-T10-T9).
[ST]2: Increase the R&D activities with a particular interest in endemic species (S5-T1-T7).
[ST]3: Increase contracted production using areas that can be allocated to avoid uncertainty in demand (S3-S1-T2).
[ST]4: Strengthen the relationship between state and occupational organizations to increase industrial incentives (S9-S10-S8-T8-T5-T6).
[WO]1: Improve the logistics systems according to Türkiye's advantageous geographic location and new initiatives (W4-W2- O1-O3-O4-O5).
[WO]2: Canalize the youth to floricultural education to improve the business cycle (W8-W5-W7-O7-O8-O9).
[WO]3: Reduce middleman commissions and informal production to watch the domestic competition (W9-W10-O6-O9-O10).
[WO]4: Improve the quality standards with modern production approaches to replace the falling production in Europe (W6-O2-O10).
[WT]1: Minimize the foreign-source dependency and costs both with R&D activities and governmental support (W1-W3-W7-T1-T3-T5-T6-T7-T8).
[WT]2: Improve the marketing system and logistics infrastructure and facilitate customs transactions to compete on a global scale (W4-W2-W7-T4-T2-T8-T10).
[SO]1: Give prominence to Floriculture among other agriculture-based industries (S7-S6-S5-S4-S3-S8-O9-O6-O5-O2-O7-O8).
[SO]2: Adapt the existing floriculture legislation to EU legislation (S10-S9-O10-O4).
[SO]3: Use elemental advantages to produce in a natural environment, expand product portfolio and increase market share (S1-S2-S3-O1-O3).

Table 5. BOCR criteria for Turkish floriculture industry

Benefits Sub-Network	Opportunities Sub-Network
Production	Production
B1: Increased modern agricultural practices.	O1: Increased environment-based good agricultural practices.
B2: Increased product variety.	O2: Increased use of indigenous seed and endemic flower species.
B3: Establishment of organized production areas.	O3: Increased number of domestic patents (production systems, equipment, and seed).
Logistics	Logistics
B4: More efficient use of logistics infrastructure and logistical advantages.	O4: Logistics village installation specific to the industry.
B5: Increased use of modern storage and cold chain applications.	O5: Increased green transport and storage applications.
Marketing-Labor	Marketing-Labor
B6: New job creation and employment.	O6: Growth of enterprises operating in the industry.
B7: Increased industrial recognition and reliability.	O7: Increase in export rate.
Environmental-Political	Environmental-Political
B8: More efficient use of soil and water resources.	O8: Delimitation to greenhouse gas emissions.
B9: Establishment of public institutions that supervise the industry.	O9: To be involved in the decision-making processes of international organizations.
Costs Sub-Network	Risks Sub-Network
Production	Production
C1: Input costs (energy, fuel, land, fertilizer, pesticide, patent ...)	R1: Import dependence on items such as technology, raw materials, and energy.
C2: Costs of production technologies	R2: Lack of sufficient results from R&D activities.
C3: R&D costs	R3: Problems in production finance.
Logistics	Logistics
C4: Transportation, storage, packaging, and deteriorated product costs	R4: Logistics investments fail to comply with the industry's needs.
C5: Logistics system installation costs	R5: Exclusion from the global floriculture distribution network.
C6: Customs costs	
Marketing-Labor	Marketing-Labor
C7: Training costs	R6: Failure to adapt to the change in trend and demand.
C8: Marketing costs	R7: Inadequate market share.
Environmental-Political	Environmental-Political
C9: Insurance costs	R8: Natural disasters, seasonal differentiation, global warming.
C10: Environmental tax	R9: Financial markets, political conflicts, and international problems.

After determining strategic criteria and alternatives, we selected the sub-criteria for the decision networks of the BOCR merits that we will use to evaluate the selection problem. For that purpose, production, logistics, marketing-labor, and environmental politics are defined as sub-criteria in all decision networks (Since the number of sub-criteria in the clusters are not sufficient for pairwise comparison, the clusters of marketing-labor and environmental-political have been combined). Table 5 shows our criteria system for the decision networks of the BOCR merits.

The next step involves determining the interactions between these elements and the internal and external dependencies and feedbacks. The developed network model with all its components is visualized in Figure 1. A uni/bi-directional arrow depicts an interactive relation between any two nodes at different clusters. Also, a loop typed arrow is used to identify the inner-dependency between the nodes under the same cluster.

A survey consisting of 53 questions with 255 pairwise comparisons is used to calculate the weights of identified relations. As the comparisons are prone to consistency issues, the consistencies of the individual surveys of the 12 experts (1 assoc. prof., 1 asst. prof. and 3 PhD candidates from the department of horticulture; 1 assoc. prof. and 1 asst. prof. from the department of agricultural economics; 1 prof. from the department of accounting and finance; and 1 PhD candidate from the department of public law which has a special interest on environmental tax law; 2 floriculture company owner; 1 agricultural engineer.) are calculated using Super Decisions software version 2.6.0, and they are all found less than the suggested threshold of 10% (Saaty, 1990).

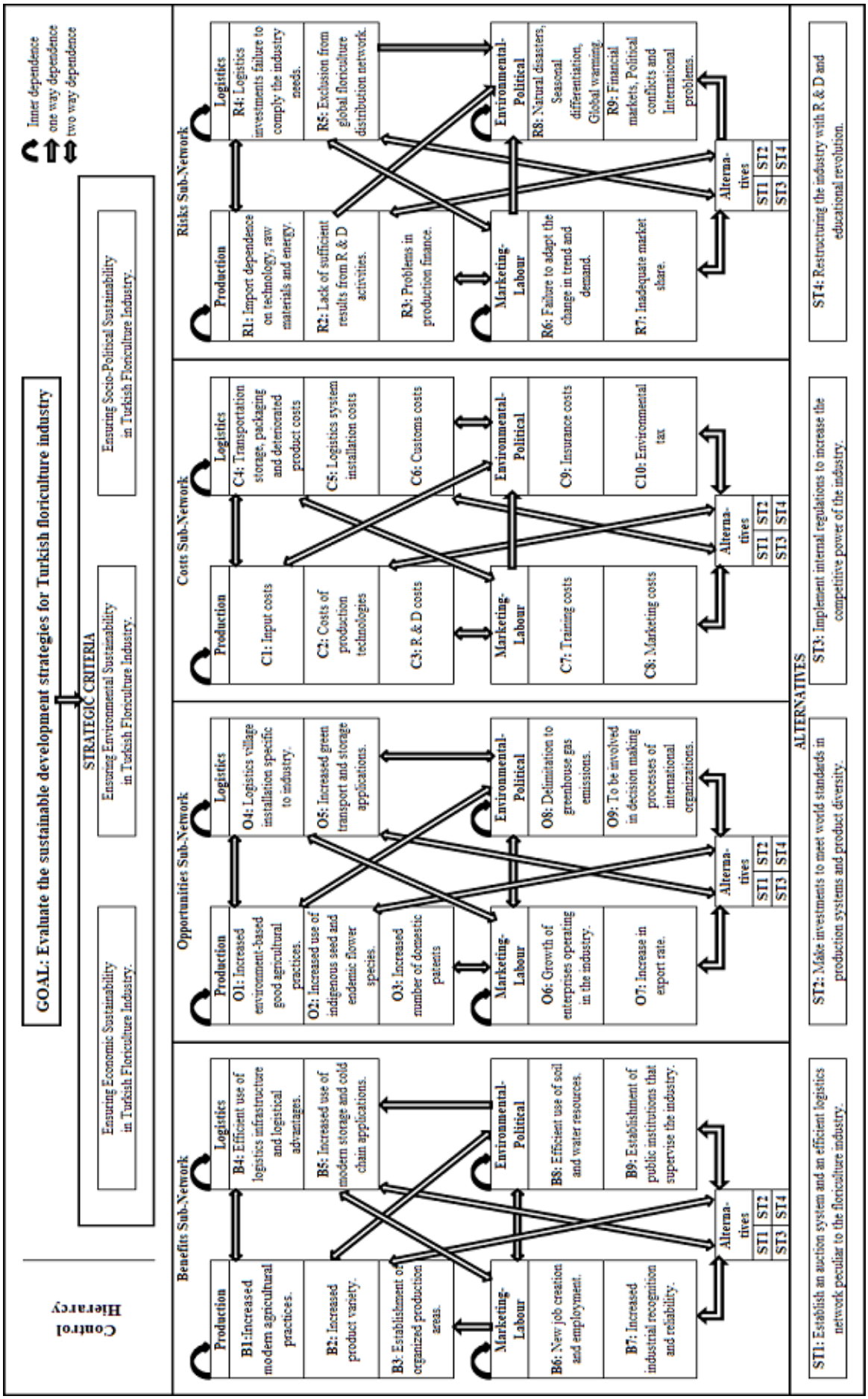

Figure 1. Proposed ANP-BOCR model for Turkish floriculture.

3. Results and Discussion

The separately applied surveys are gathered using the geometric mean of individual judgments for each pairwise comparison to obtain a group decision (Saaty, 2006). This approach, which has been mathematically demonstrated by Aczel and Saaty (1983), is a convenient procedure to unify the individual judgments, as it maintains the comparison matrices' reciprocal property. This procedure, including related priorities, is illustrated in Figure 2.

In Figure 2, *N* is the normalized value, prioritizing the criteria against the others in the cluster. *L* is the limiting values calculated in the limit super-matrices, which indicate the overall influence of the criteria in the network. The highest weighted normalized values at the related cluster and the highest weighted limiting values at the interconnected network are circled.

When cluster-based evaluations are performed, 'B3' and 'O3' are the sub-criteria with the most positive influence in production clusters, whereas 'C1' and 'R3' are the ones with the most negative influence. When other clusters are examined in a similar way, 'B5' and 'O4' are the sub-criteria with the most positive influence in logistics clusters, whereas 'C4' and 'R4' are the ones with the most negative influence. In marketing/labor clusters, 'B7' and 'O7' have the most positive influence, whereas 'C8' and 'R7' have the most negative influence. In politic/environmental clusters, 'B9' and 'O9' have the most positive influence, whereas 'C9' and 'R8' are the sub-criteria with the most negative influence. When the limiting values are observed, 'B3' in the benefits subnetwork and 'O7' in the opportunities subnetwork have the most positive influences overall, while in the cost subnetwork 'C1' and risk subnetwork 'R7' have the most negative influences.

Agricultural production in Türkiye has mostly been conducted in fragmented small lands (Atasoy, 2017). With the adoption of a sustainable floriculture approach, establishing organized production areas will eliminate inefficiencies and high rental costs. It is clear that an action plan should be formed in order to reduce the foreign dependency on important industrial inputs such as energy, fuel, fertilizer, and pesticide. Also in this context, the experts evaluate that increasing the number of domestic patents will significantly contribute to sustainable development by enhancing the competitive capacity and reducing costs in the long term.

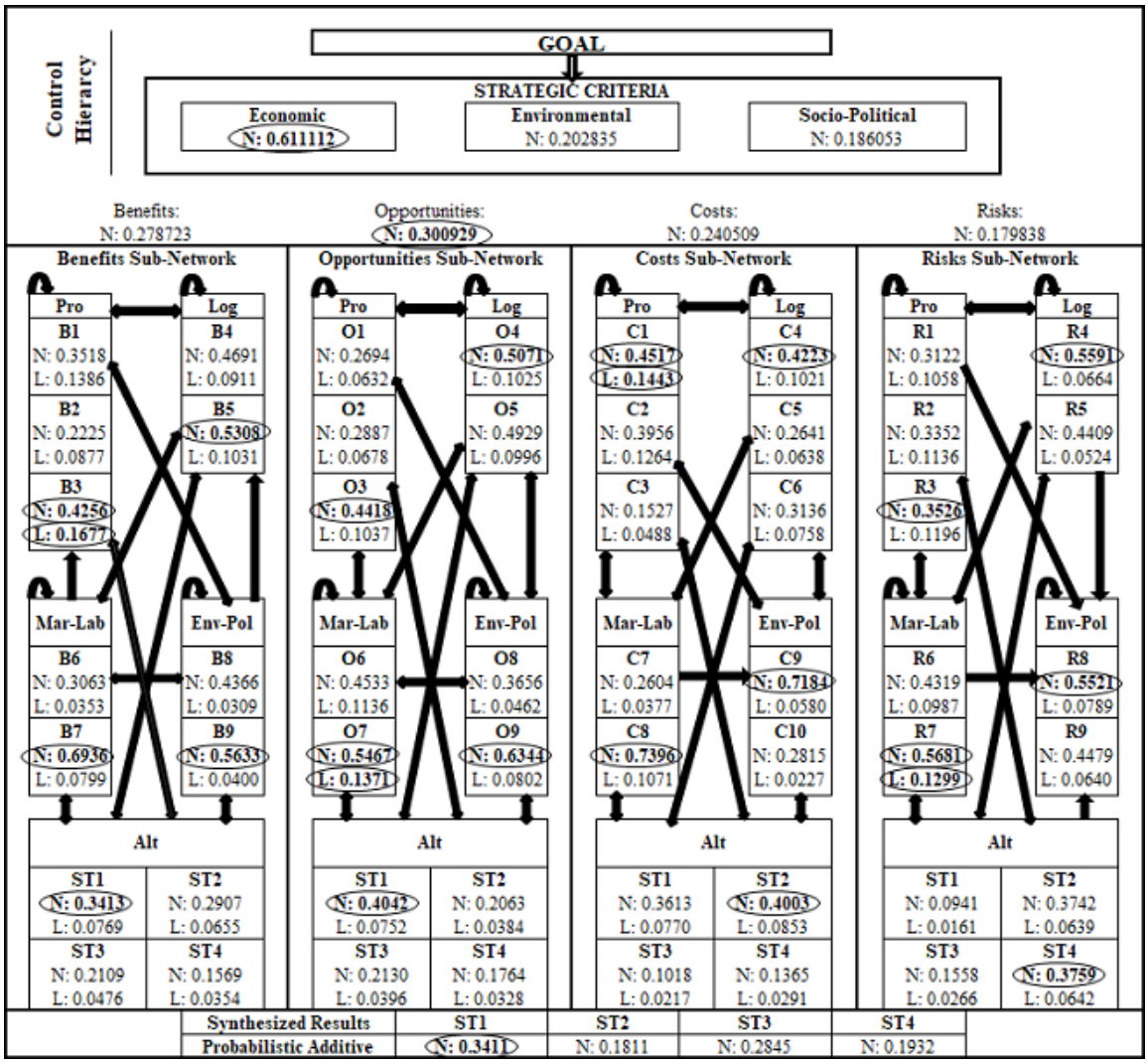

Figure 2. Consolidated group decision results

In Türkiye, the logistics of agricultural products mostly proceeds through commission merchants (Bignebat et al., 2009; Appel et al., 2014). Establishing individual logistics systems is not considered as a possible structure for small and medium-sized enterprises in the short term. The lack of opportunities for producers in terms of logistics and marketing at a later stage strengthens the hand of commission merchants. The competitive advantage arising from Türkiye's geopolitical position has not been supported with the right investments and could not establish a structure to meet today's needs. While inadequate market shares and marketing costs standouts as major concerns of the industry's representatives, it is clear that improvements in marketing channels will play an important role in the sustainability of Turkish floriculture.

According to the results 'ST1: Establish an auction system and an efficient logistics network peculiar to the floriculture industry' strategy has been computed as the best alternative. Meanwhile, the strategy of 'ST1' is the alternative with the most positive influence on the benefits and opportunities subnetworks. The strategy of 'ST3' has been evaluated as the alternative with the most negligible negative influence in terms of cost. Also, 'ST1' has been computed as the one with the most negligible negative influence in terms of risk. Therefore, the strategic criteria of 'Ensuring Economic Sustainability in Turkish Floriculture Industry' has been evaluated as more influential on the sustainable development of the Turkish floriculture industry.

Sustainable agriculture is bound up with the carbon footprints that evaluate the total volume of greenhouse gas emissions generated by a business activity or accumulated over the products' lives (Al-Mansour and Jejcic, 2017). If Türkiye wants to be involved in the decision-making processes of international organizations and to increase its share in foreign markets, awareness of these and similar concepts should be increased. It is not possible to talk about sustainability without considering its environmental dimension.

4.1 Sensitivity Analysis

As the ANP method carries out the comparisons based on individual perceptions, the results may differ depending on changes in the priorities of the BOCR merits. At this stage, we conducted a sensitivity analysis to examine whether the priority order of the alternatives would change. Super Decisions Software allows a "what-if" type sensitivity analysis. In Figure 3, the influences on the alternatives' weights are visualized with the selected independent variables: Benefits, Opportunities, and Costs, respectively. We did not include the graph for the risk merit since it did not cause a change in the order of the alternatives.

According to Figure 3, no matter how the weight of the Benefits independent variable changes, ST1 remains the best alternative. However, as the weight increases, ST2 surpasses other strategies in the ranking, indicating that ST2 will be a more positive strategy than ST3 and ST4 in a benefit-oriented evaluation. When we make the same assessment with the Opportunities independent variable, we can see that the ST3 strategy is superior in ranking compared to ST1 in a pretty small range. However, as the weight increases, ST1 has an absolute advantage as the best alternative. When the Costs merit is assigned as the independent variable, we encountered inconsistent results. As the weight of costs increases, ST1, which is observed as the best alternative, seems to have lost the lead with a dramatic decrease. In a cost-oriented evaluation, ST3 would be the best strategy.

The sensitivity analysis results reveal the importance of using MCDM methods to cope with the complicated structure of sustainability in agricultural practices. As can be seen, changing the weight of the concepts or a narrow-oriented approach in the decision-making stages would cause alteration in the rank of the strategies.

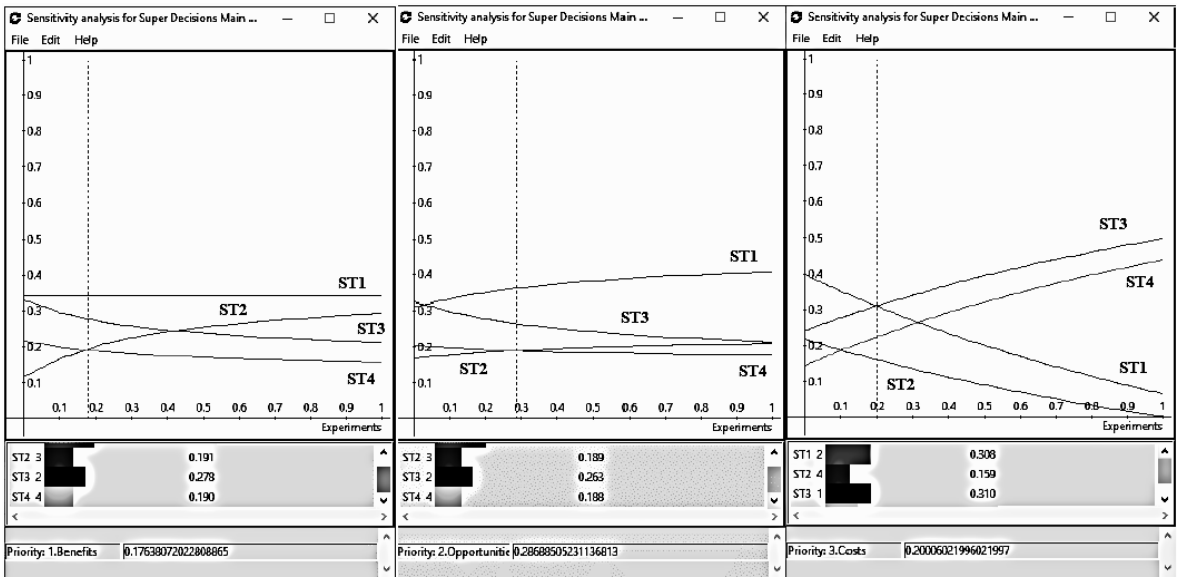

Figure 3. Sensitivity analysis: independent variables: benefits, opportunities, costs.

4. Conclusion

Based on the analysis performed and sensitivity results considered, the best strategy for the sustainable development of Turkish Floriculture has been evaluated as 'Establishing an auction system and an efficient logistics network peculiar to the floriculture industry. Underlying principles of this strategy is: Developing a sustainable, export-oriented logistics system in conformity with Türkiye's advantageous geographic location where effective intermodal transport networks are used, cold chain applications that catch the world standards are adopted, and the deterioration rate of floriculture products is minimized; without any break in the chain. With the proper location selection, supported with such studies on infrastructure, storage, packaging, product standardization, and quality standards, it is an investment that will improve the Turkish floriculture industry's position in the global arena and ensure its sustainable development.

The participated experts have evaluated that economic sustainability has the highest significance level between the three main components of the sustainability concept. Such a low evaluation of environmental and socio-political sustainability concepts in terms of significance level partially reveals the industrial sustainability perspective of developing countries through the Turkish floriculture case.

We believe that this study and the criterion system we have identified draws an applicable road map to Turkish Floriculture and similar countries and related industries.

Author Contributions

Concept: A.Ü.Ç. (100%), Design: A.Ü.Ç. (50%) and S.E.A. (50%), Supervision: S.E.A. (100%), Data collection and/or processing: A.Ü.Ç. (100%), Data analysis and/or interpretation: A.Ü.Ç. (100%), Literature search: A.Ü.Ç. (100%), Writing: A.Ü.Ç. (50%) and S.E.A. (50%), Critical review: A.Ü.Ç. (50%) and S.E.A. (50%). Submission and revision. All authors reviewed and approved final version of the manuscript.

Conflict of Interest

The authors declared that there is no conflict of interest.

Ethical Consideration

Ethics committee approval was not required for this study because of there was no study on animals or humans.

Acknowledgments

This study is based on the master's thesis titled: "Evaluating sustainable development strategies for the Turkish floriculture industry and its sustainable financing mechanisms", conducted at Galatasaray University Graduate School of Science and Engineering, by A. Ürem Çürük, under the supervision of S. Emre Alptekin.

References

Aczél J, Saaty TL. 1983. Procedures for synthesizing ratio judgments. J Math Psychol, 27(1): 93-102.

Aker JC. 2011. Dial "a" for agriculture: A review of information and communication technologies for agricultural extension in developing countries. Agri Econ, 42(6): 631-647.

Al-Mansour F, Jejcic V. 2017. A model calculation of the carbon footprint of agricultural products: the case of Slovenia. Energy, 136: 7-15.

Appel A, Franz M, Hassler M. 2014. Intermediaries in agro-food networks in Turkey: how middlemen respond to transforming food market structures. J Geog Soc Berlin, 145(3): 148-157.

Atasoy Y. 2017. Repossession, Re-informalization and Dispossession: The 'Muddy Terrain' of Land Commodification in Turkey. J Agrarian Chan, 17(4): 657-679.

Baris ME, Uslu A. 2009. Cut flower production and marketing in Türkiye. African J Agri Res, 4(9): 765-771.

Bignebat C, Koç AA, Lemeilleur S. 2009. Small producers, supermarkets, and the role of intermediaries in Turkey's fresh fruit and vegetable market. Agri Econ, 40(S1): 807-816.

Burnett S, Mattson N, Krug B, Lopez R. 2011. Floriculture sustainability research coalition: bringing the latest sustainability research to the industry. Hort Technol,21(6): 692-693.

Clapp J, Newell P, Brent ZW. 2018. The global political economy of climate change, agriculture and food systems. J Peasant Stud, 45(1): 80-88.

Dantsis T, Douma C, Giourga C, Loumou A, Polychronaki EA. 2010. A methodological approach to assess and compare the sustainability level of agricultural plant production systems. Ecol Indic, 10(2): 256-263.

de Janvry A. 2010. Agriculture for development: New paradigm and options for success. Agri Econ, 41(1): 17-36.

Demirel NÇ, Yücenur GN, Demirel T, Muşdal H. 2012. Risk-based evaluation of Turkish agricultural strategies using fuzzy AHP and fuzzy ANP. Human Ecol Risk Asses Int J, 18(3): 685-702.

Fan S. 2020. Reflections of food policy evolution over the last three decades. App Econ Persp Pol, 42(3): 380–394.

Gebreeyesus M. 2015. Firm adoption of international standards: Evidence from the Ethiopian floriculture sector. AgriEcon, 46(S1): 139-155.

GTHB. 2017. Republic of Türkiye, Ministry of Food, Agriculture and Livestock Strategic Plan 2018-2022. URL: https://www.tarimorman.gov.tr/SGB/Belgeler/2013-2017/GTHB%202018-2022%20STRATEJI%CC%87K%20PLAN.PDF (access date: December 08, 2018).

Hall TJ, Dennis JH, Lopez RG, Marshall MI. 2009. Factors affecting growers' willingness to adopt sustainable floriculture practices. Hort Sci, 44(5): 1346-1351.

ITC. 2021. International Trade Centre Statistics, Trade Map. Product: 06 Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage. URL: https://www.trademap.org/Index.aspx (access date: October 07, 2021).

Larson D, Martin W, Sahin S, Tsigas M. 2016. Agricultural policies and trade paths in Turkey. World Econ, 39(8): 1194-1224.

Lee DR, Barrett CB, McPeak JG. 2006. Policy, technology and management strategies for achieving sustainable agricultural intensification. Agri Econ, 34(2): 123-127.

Loizou E, Karelakis C, Galanopoulos K, Mattas K. 2019. The role of agriculture as a development tool for a regional economy. Agril Sys, 173: 482-490.

Mekonnen DK, Spielman DJ, Fonsah EG, Dorfman JH. 2015. Innovation systems and technical efficiency in developing-country agriculture. Agri Econ, 46(5): 689-702.

Muhammad A, Amponsah WA, Dennis JH. 2010. The impact of preferential trade arrangements on EU imports from developing countries: The case of fresh-cut flowers. App Econ Persp Pol, 32(2): 254-274.

Mulder J, Brent AC. 2006. Selection of sustainable rural agriculture projects in South Africa: Case studies in the Landcare Programme. J Sust Agri, 28(2): 55-84.

Norton GW. 2020. Lessons from a career in agricultural development and research evaluation. App Econ Persp Pol, 42(2): 151-167.

Pannell DJ, Schilizzi S. 1999. Sustainable agriculture: A matter of ecology, equity, economic efficiency or expedience? J Sust Agri, 13(4): 57-66.

Pawlak K, Kołodziejczak M. 2020. The role of agriculture in ensuring food security in developing countries: Considerations in the context of the problem of sustainable food production. Sust, 12(13): 5488. DOI: 10.3390/su12135488.

Reig-Martínez E, Gómez-Limón JA, Picazo-Tadeo AJ. 2011. Ranking farms with a composite indicator of sustainability. Agri Econ, 42(5): 561-575.

Saaty TL. 2004. Fundamentals of the analytic network process—multiple networks with benefits, costs, opportunities and risks. J Sys Sci Sys Eng, 13(3): 348-379.

Saaty TL. 2006. The analytic network process. In: Saaty TL, Vargas LG (Eds), Decision Making With the Analytic Network Process: Economic, Political, Social and Technological Applications with Benefits, Opportunities, Costs and Risk. Springer Science+Business Media LLC, New York, US, pp: 1-39.

SÜSBİR. 2020. Ornamental plants sector report. URL: http://www.susbir.org.tr/belgeler/raporlar/sus-bitkileri-sektor-raporu.pdf (access date: October 01, 2021).

Talukder B, Hipel KW, van Loon GW. 2018. Using multi-criteria decision analysis for assessing sustainability of agricultural systems. Sust Devel, 26(6): 781-799.

TÜİK. 2021. Turkish Statistical Institute, Plant Production Statistics. URL: https://data.tuik.gov.tr/Kategori/Get Kategori? p=Tarim-111 (access date: October 07, 2021).

TÜSSİDE. 2017. Seed sector national strategy development project: The ornamental plants growers union, ornamental plants sector national strategy report. URL: http://www.susbir.org.tr/images/duyurular/ulusal-strateji-raporu.pdf (access date: December 06, 2018).

Veisi H, Liaghati H, Alipour A. 2016. Developing an ethics-based approach to indicators of sustainable agriculture using analytic hierarchy process (AHP). Ecol Indic, 60(1): 644-654.

Wani MA, Nazki IT, Din A, Iqbal S, Wani SA, Khan FU, Neelofar K. 2018. Floriculture Sustainability Initiative: The Dawn of New Era. In: Lichtfouse E (Ed), Sustainable Agriculture Reviews 27, Springer International Publishing, Cham, New York, US, pp: 91–127.

Weihrich H. 1982. The TOWS Matrix—A tool for situational analysis. Long Range Plan, 15(2): 54-66.

Wijnands J. 2005. Sustainable International networks in the flower industry: Bridging empirical findings and theoretical approaches. Int Soc Horti Sci, Leuven, Belgium, pp: 92.

Wijnmalen DJ. 2007. Analysis of benefits, opportunities, costs, and risks (BOCR) with the AHP–ANP: A critical validation. Math Comp Model, 46(7-8): 892-905.

Zencirkiran M, Gürbüz IB. 2009. Turkish ornamental plants sector in the European Union screening process. J Fruit Ornaml Plant Res, 17(2): 235-250.

Zilberman D, Gordon B, Hochman G, Wesseler J. 2018. Economics of sustainable development and the bioeconomy. App Econ Persp Pol, 40(1): 22-37.