INTERNATIONAL BALKAN UNIVERSITY

INTERNATIONAL APPLIED STATISTICS CONFERENCE UYIK

30 years TOKAT GAZIOSMANPASA UNIVERSITY





III. INTERNATIONAL APPLIED STATISTICS CONFERENCE

(UYIK 2022)

In the name of Prof. Dr. Tahsin KESİCİ



PROCEEDINGS BOOK

22 JUNE - 24 JUNE 2022 SKOPJE, N. MACEDONIA

III. INTERNATIONAL APPLIED STATISTICS CONFERENCE

Proceedings Book of the UYIK-2022

ISBN: 978-975-7328-85-8

HYBRID (ONLINE AND FACE TO FACE) - SKOPJE / N. MACEDONIA

Note: All administrative, academic and legal responsibilities of the departments belong to their authors

Proceedings Book of the III. International Applied Statistics Conference (UYIK-2022)

Publisher:
Tokat Gaziosmanpasa University
Editors:
Yalcin TAHTALI
E-Book Layout, Preparation and Composition:
Yalcin TAHTALI, Samet Hasan ABACI, Kaan KAPLAN, Furkan YILMAZ
All published articles were peer-reviewed by Scientific Committee
The organizers do not have any legal liability for to contents of the presentation texts
Organized by
Tokat Gaziosmanpasa University, Tokat, Turkey
International Balkan University, Skopje, N. Macedonia

COMMITTEES

HONORARY CHAIRMAN

Prof. Dr. Mustafa ŞENTOP, Speaker of the Grand National Assembly of Türkiye

Prof. Dr. Vahit KİRİŞÇİ, Republic of Türkiye Minister of Agriculture and Forestry

HONOURARY COMMITTEE

Prof. Dr. Bünyamin ŞAHİN, Rector of Tokat Gaziosmanpaşa University

Prof. Dr. Mehmet Dursun ERDEM, Rector of the International Balkan University

CONFERENCE CO-CHAIRMANS

Prof. Dr. İsa GÖKÇE, Tokat Gaziosmanpaşa University

Prof. Dr. Orhan KAVUNCU, Kastamonu University

Prof. Dr. Rüstem CANGİ, Tokat Gaziosmanpaşa University

Prof. Dr. Soner ÇANKAYA, Ondokuz Mayis University

Assoc. Prof. Dr. Yalçın TAHTALI, Tokat Gaziosmanpaşa University

Dr. Saniye DEMİR, Tokat Gaziosmanpaşa University

CONFERENCE SECRETARIAT

Assoc. Prof. Dr. Samet Hasan ABACI, Ondokuz Mayıs University

Dr. Nur İlkay ABACI, Ondokuz Mayıs University

Dr. Lütfi BAYYURT, Tokat Gaziosmanpaşa University

Furkan YILMAZ, Tokat Gaziosmanpaşa University

Burak FIRAT, Tokat Gaziosmanpaşa University

ORGANIZING COMMITTEE

Prof. Dr. Marti Jane ANDERSON, Massey University, New Zealand

Prof. Dr. Kaspar BIENEFELD, Humboldt University of Berlin, German

Prof. Dr. Aşir GENÇ, Necmettin Erbakan University, Türkiye

Prof. Dr. Khalid JAVED, University of Veterinary and Animal Sciences, Pakistan

Prof. Dr. Michael JORDAN, University of California, Berkeley, USA

Prof. Dr. Sıddık KESKİN, Yüzüncü Yıl University, Türkiye

Prof. Dr. Nurhan KESKİN, Yüzüncü Yıl Üniversity, Türkiye

Prof. Dr. Zahide KOCABAŞ, Ankara University, Türkiye

Prof. Dr. Masood H. SIDDIQUI, University of Lucknow, India

Prof. Dr. Mustafa ŞAHİN, K. Maraş Sutcu Imam University, Türkiye

Prof. Dr. Vjekoslav TANASKOVIK, Ss.Cyril and Methodius University, Macedonia

Prof. Dr. Arda YILDIRIM, Tokat Gaziosmanpaşa University, Türkiye

Assoc. Prof. Dr. Songül AKIN, Dicle University, Türkiye

Assoc. Prof. Dr. Francesca BERTOLINI, Technical University of Denmark, Denmark

Assoc. Prof. Dr. Şener BILALLI, International Balkan University, Macedonia

Assoc. Prof. Dr. Rukiye DAĞALP, Ankara University, Türkiye

Assoc. Prof. Dr. Songül GÜRSOY, Dicle University, Türkiye

Assoc. Prof. Dr. Dariusz PIWCZYŃSKI, UTP University Sci and Tech, Poland

Assoc. Prof. Dr. Desta MEKONNEN, Mizan Tepi University , Ethiopia

Assoc. Prof. Dr. Mile MARKOSKI, SS.Cyril and Methodius University, Macedonia

Assoc. Prof. Dr. Taner TUNÇ, Ondokuz Mayis University, Türkiye

Assoc. Prof. Dr. Adnan ÜNALAN, Niğde Ömer Halisdemir University, Türkiye

Assist. Prof. Dr. Hao CHENG, University of California, Davis, USA

Assist. Prof. Dr. Diego JARQUIN, University of Florida, USA

Assist. Prof. Dr. Breno FRAGOMENI, University of Connecticut, USA

Assist. Prof. Dr.Francisco PEÑAGARİCANO, University of Wisconsin-Madison, USA

Dr. Yunus AKDOĞAN, Selçuk University, Türkiye

Dr. Maghsoud BESHARATI, University of Tebriz, Iran

Dr. Emine BERBEROĞLU, Tokat Gaziosmanpaşa University, Türkiye

Dr. Rabia Albayrak DELİALİOĞLU, Ankara University, Türkiye

Dr. Ozan EVKAYA, Padova University, İtaly

Dr. Dhananjay GAIKWAD, Amity University, India

Dr. Yasemin GEDİK, Eskişehir Osmangazi University, Türkiye

Dr. Kadir KARAKAYA, Selçuk University, Türkiye

Dr. Yeliz KAŞKO ARICI, Ordu University, Türkiye

Dr. Krishna Kumar CHATURVEDI, Indian Agricultural Statistics Research Institute, India

Dr. Aycan MUTLU YAĞANOĞLU, Atatürk University, Türkiye

Dr. Tiago OlIVOTO, Federal University of Santa Catarina, Brazil

Dr. Ahmet PEKGÖR, Necmettin Erbakan University, Türkiye

Dr. Mahdi SAATCHI, Iowa State University, USA

Dr. Dilek SABANCI, Tokat Gaziosmanpaşa University, Türkiye

Dr. Bruno Giacomini SARI, Federal University of Santa Maria, Brazil

Dr. Thobela Louis TYASI, University of Limpopo, South Africa

Res. Assist. Kaan KAPLAN, Tokat Gaziosmanpaşa University, Türkiye

SCIENTIFIC COMMITTEE

Prof. Dr. Willy ARAFAH, Trisakti University, Indonesia

Prof. Dr. Hülya ATIL, Ege University, Türkiye

Prof. Dr. Mazroor Ahmad BAJWA, Balochistan University, Pakistan

Prof. Dr. Snezana BILIC, International Balkan University, N. Macedonia

Prof. Dr. Ömer Cevdet BİLGİN, Atatürk University, Türkiye

Prof. Dr. Saim BOZTEPE, Selçuk University, Türkiye

Prof. Dr. Zeynel CEBECİ, Çukurova University, Türkiye

Prof. Dr. Kabir Haruna Danja, Federal College of Education Zaira, Nigeria

Prof. Dr. Bejtulla DEMIRI, International Balkan University, N. Macedonia

Prof. Dr. Jacek DLUGOSZ, UTP University, Poland

Prof. Dr. Ercan EFE, Kahramanaraş Sütçü İmam University, Türkiye

Prof. Dr. Sait EKİNCİ, Kahramanmaraş Sütçü İmam University, Türkiye

Prof. Dr. Ali FARAJZADEH, Razi University, İran

Prof. Dr. Mehmet Ziya FIRAT, Akdeniz University, Türkiye

Prof. Dr. Özkan GÖRGÜLÜ, Kırşehir Ahi Evran University, Türkiye

Prof. Dr. Wilhelm GRZESIAK, West Pomeranian University of Technology, Poland

Prof. Dr. Asep HERMAWAN, Trisakti University, Indonesia

Prof. Dr. Özlem İLK DAĞ, Orta Doğu Teknik University, Türkiye

Prof. Dr. Khalid JAVED, University of Veterinary and Animal Sciences, Pakistan

Prof. Dr. Daniel LIBERACKI, Poznan University of Life Sciences, Poland

Prof. Dr. Violeta MADZOVA, International Balkan University, N. Macedonia

Prof. Dr. Mehmet MENDEŞ, Çanakkale Onsekiz Mart University, Türkiye

Prof. Dr. Hasan ÖNDER, Ondokuz Mayıs University, Türkiye

Prof. Dr. Hikmet ORHAN, Suleyman Demirel University, Türkiye

Prof. Dr. Emin ÖZKÖSE, Kahramanaraş Sütçü İmam University, Türkiye

Prof. Dr. Renata PILARCZYK, West Pomeranian University of Technology, Poland

Prof. Dr. Levent SANGÜN, Çukurova University, Türkiye

Prof. Dr. Kire SHARLAMANOV, International Balkan University, N. Macedonia

Prof. Dr. Çiğdem Takma, Ege University, Türkiye

Prof. Dr. Mohammad Masood TARIQ, Balochistan University, Pakistan

Prof. Dr. Muhammad TARIQ, Agrıculture University, Pakistan

Prof. Dr. Ali Reza VAEZİ, Zanjan University, İranian

Prof. Dr. Sanja Adzap VELICKOVSKA, International Balkan University, N. Macedonia

Prof. Dr. Abdulmojeed YAKUBU, Nasarawa State University, Nigeria

Prof Dr. Daniel ZABORSKİ, West Pomeranian University of Technology, Poland

Prof. Dr. X.C. ZHANG, Agrıcultural Research Center, United States

Assoc. Prof. Dr. Ömer ALKAN, Atatürk University, Türkiye

Assoc. Prof. Dr. Şenol ÇELİK, Bingöl University, Türkiye

Assoc. Prof. Dr. Yakut GEVREKÇİ, Ege University, Türkiye

Assoc. Prof. Dr. Farhat IQBAL, Balochistan University, Pakistan

Assoc. Prof. Dr. Abdulkerim KARAARSLAN, Atatürk University, Türkiye

Assoc. Prof. Dr. Natasha KRALEVA, International Balkan University, N. Macedonia

Assoc. Prof. Dr. Dariusz PIWCZYNSKI, UTP University, Poland

Assoc. Prof. Dr. Roman ROLBİECKİ, UTP University, Poland

Assoc. Prof. Dr. Leman TOMAK, Ondokuz Mayıs University, Türkiye

Assoc. Prof. Dr. Fatih ÜÇKARDEŞ, Adıyaman University, Türkiye

Dr. Asım FARAZ, Bahauddin Zakariya University, Pakistan

Dr. Emin IDRIZI, International Balkan University, N. Macedonia

Dr. Abdurrahman KARA, Dicle University, Türkiye

Dr. Hande KÜÇÜKÖNDER, Bartın University, Türkiye

Dr. Lujeta SADIKU, International Balkan University, N. Macedonia

Dr. Liza Halili SULEJMANİ, International Balkan University, N. Macedonia

Dr. Ferhat ÜNAL, Middle East Technical University, Türkiye

Dr. Thobela Louis TYASİ, Limpopo University, North Africa

Dr. Abdul Waheed, Bahauddin Zakariya University, Pakistan

MSc. Gürbüz MIZRAK, Ankara University, Türkiye

Note: Given in order of title and surname

BIOGRAPHY OF PROF. DR. TAHSİN KESİCİ



Tahsin Kesici was born on 01.03.1938 in Ermenek. He completed his primary and secondary education in this city. He graduated from Konya High School in 1956 and from Ankara University Faculty of Agriculture in 1960. With a scholarship given by Italy, he conducted research in this country for eight months between 1960-1961. He attended vocational courses after graduation at the University of Milan.

In June 1961, Kesici entered Ankara University, Faculty of Agriculture, Department of Animal Science as an assistant, and completed his doctorate in 1964. Between 1965 and 1967, he fulfilled his military service. After his military service, he started to work in the newly established Genetics and Statistics Department at the Faculty of Agriculture. Between 1969 and 1971, he did post-doctoral studies on his subject in Federal Germany for two years. He became an associate professor in 1971 and served as the Chair of Genetics and Statistics between 1972-1982. Later, he was the head of this unit, which was restructured as the Department of Biometrics-Genetics, for seventeen years.

Kesici, who became a professor in 1979, graduated from A.U. between 1980-1984. He served as the Deputy Dean of the Faculty of Agriculture, the Dean of the Faculty of Agriculture in 1984-1987, and the Vice Rector of Ankara University between 1987-1992. Between 1993 and 2002, he served as a member of the Ankara University Board of Directors for nine years. He served as the Founding President of the Informatics Department affiliated to the Rectorate and the Director of the School of Foreign Languages.

He was appointed as a member of the Council of Higher Education in July 2002. While he was still in this position, he was appointed as the Rector of TOBB University of Economics and Technology in September 2004. prof. Dr. Tahsin Kesici's foreign languages are German and Italian. He knows enough French and English to follow the literature in his field. He is married and has two children.

PREFACE

Dear Scientists and Dear Friends,

The third International Applied Statistics Conference, hosted by the International Balkan University and in cooperation with Tokat Gaziosmanpaşa University, was held in Skopje with the contribution and participation of a large academic group, both face-to-face and online.

As it is known, we held our first conference in the name of Prof. Dr. Yüksel Bek in October 2020 under pandemic conditions. The second conference, on the twenty-fifth anniversary of his death, we had the honor of holding our congress in memory of our late Prof Dr. Orhan Duzguneş who gave his life to statistics and genetics and had great efforts in the training of many teachers in our country. This year, we had our third conference was in the name of Prof. Dr. Tahsin KESİCİ.

As the congress organizing committee, we focus on two themes while organizing these congresses; investment in young people and fidelity to those who contribute to this science. On this occasion, while we organize our congresses in the name of our professors to keep their memories alive, we try to stand by the young researchers by organizing various courses with the efforts of valuable teachers within the congress.

For this purpose, 7 different course programs were organized within the scope of the congress, and approximately 175 trainees participated in these courses. In addition, 105 researchers from 7 different countries participated in the congress with approximately 133 oral presentations.

On the occasion of the conference, the honorary president of the conference and the President of the Turkish Grand National Assembly, Prof. Dr. Mustafa Şentop, for his material and moral contributions to the organization of this conference; especially, Tokat Gaziosmanpasa University rector Prof. Dr. Bünyamin Şahin and to the entire university administration, the rector of the International Balkan University, Prof. Dr. Mehmet Dursun Erdem, we want to thank.

We would also like to thank all our teachers and colleagues who contributed to the organization of the congress and courses.

The third of our congress, “3. International Applied Statistics Conference”, again with your active contribution and participation, our esteemed teacher, in the name of Prof. Dr. Tahsin KESİCİ, we are planning to hold it in Skopje in June 2022, hosted by the International Balkan University and with the cooperation of Tokat Gaziosmanpaşa University. We will be honored and happy to host you in Macedonia during one of the most beautiful times of the year.

Our next congress is “4. International Congress of Applied Statistics" We are planning to hold the in Sarajevo in April 2023, hosted by the International University of Sarajevo, in cooperation with Tokat Gaziosmanpasa University and International Balkan University, again with your active contribution and participation. We will be honored and happy to host you in Bosnia and Herzegovina in one of the most beautiful times of the year.

We hope that our congress will contribute to all applied statistics fields, be beneficial to young researchers and set an example for those who contribute to science.

Congress Organizing Committee

TABLE OF CONTENT

COMMITTEES i
BIOGRAPHY OF PROF. DR. TAHSİN KESİCİ v
PREFACE vi
TABLE OF CONTENT vii
ORAL PRESENTATIONS viii
ORAL PRESENTATIONS CONTENTS ix
POSTER PRESENTATIONS 330
POSTER PRESENTATIONS CONTENTS 331

ORAL PRESENTATIONS

ORAL PRESENTATIONS CONTENTS

Long Non-coding RNA and Their Roles in Livestock 1
The Role and Importance of Microarray Applications in Farm Animals 2
Genetik Algoritmaların İşleyişi ve Genetik Algoritma Uygulamalarında Kullanılan Operatörler 3
Neo-malthusian Population Theory in Europe 4
Ege Bölgesi ve Çevresine Ait Depremlerin Poisson Süreçleri Yardımıyla İncelenmesi 5
Ege Graben Sisteminde Meydana Gelen Depremlerin Büyüklük ve Derinliklerinin Markov Zincirleri ile Değerlendirilmesi 6
On Jumps Models and Tampered Innovations in Volatility Models and Applications 7
Comparison of Beta Mean, Beta Model and Generalized Biparabolic Distributions Regression on Milk Traits . 12
A New Flexible Discrete Distribution with Application to Zero-Inflated Regression Analysis 13
A New Lifetime Distribution Based on the Transmuted First Two Lower Records 14
Stress Strength Reliability for Discrete Natural Lindley Distribution 15
Behaviour of LER for Some Policy Modification Based on Some Claim Size Distributions 16
The Poisson Epanechnikov-Exponential Distribution with a New Count and Zero-Inflated Regression Analyses 17
Some Simulation for Ruin Probability Based on Different Ruin Scenarios 18
Topic Classification and Sentiment Analysis on Consumer Reviews on Shopping Sites 19
A New Family of Distributions: Compound Transmuted Family of Distributions Properties and Applications .. 20
Automatically Image Classification Based on a New CNN Architecture 21
Classification of Breast Cancer Diagnosis with Machine Learning Algorithms 33
The Complexity and Variation of Effect Size in Meta-Analyses 34
Türkiye'de Farklı Finansal Okuryazarlık Seviyesindeki Yatırımcıların Kripto Paraya Karşı Tutumları 35
Factors Affecting Consumer Purchasing Behavior of Environmentally Friendly Car 36
A Statistical Analysis of the System Parameters of a Fully Automated Parking System 37
Determination of Factors Affecting Bank Profits: Comparison of Multilinear Regression and Gradient Boosting Regression Methods 47
A New Bivariate Copula and Its Properties 48
Exploratory Data Analysis with Unsupervised Learning Algorithms for a Clinical Data Set 49
Estimation of the Factors Effecting Lactation Milk Yield of Holstein Cattle by the Adaptive Neuro-Fuzzy Inference System 50
ROC Analysis for the Development of Diagnostic Tests in Medical Researches: An Application in SPSS 51
Approximation Results for Adjustment Coefficient of Nonlinear Lundberg Risk Model 52
Impact of IFRS9 Implementation on Credit Risk of the Banking Sector in Kosova 53
A Study on the Use of the Relationship Between Somatic Cell Count (SCC) and Some Milk Parameters in the Diagnosis of Mastitis 54
Modeling Oil Demand in Turkey with Artificial Neural Networks, Xgboost and Time Series Analysis 55
A New Bounded Distribution as an Alternative to the Beta and Kumaraswamy Distributions: Properties and Applications 56
Life Expectancy Prediction Based on Animal Protein Consumption with Generalized Estimating Equations 57
Organik Tarım Yapan Meyve Üreticilerinin Tarım Sigortasına Yaklaşımları: Gaziantep ve Adıyaman İlleri Örneği 58
Entelektüel Sermayenin Emeklilik ve Hayat Sigorta Şirketlerinde Karlılığa Etkisi 59
Estimation of Lactation Milk Yield of Jersey Cattle by Isotonic Regression Analysis 60
Assessing Several Strategies for Estimating Average Treatment Effects in Nonparametric Model 61
Investigation of the Association Between Some Biochemical Properties in Patients with Metastatic Lung Cancer Receiving Palliative Radiotherapy 62
Sum-Lindley Poisson Model: Properties and Applications to New Count Regression 63
Associations of CAST Gene Polymorphisms with Growth and Meat Quality Traits in Small Ruminants 64
Estimation of Misclasification Rates Attribuable to Measurement Error in Non-Normal Case 65
Ranking Çanakkale Districts in Terms of Pasture Quality with Multi-Criteria Decision Making Methods 66
Ayçiçeği Fiyatları Üzerinde Etkileri Olan Faktörlerin ARDL Modeli ile Analizi 67
The Effects of Different Production Sytems on Wellfare of Dairy Goats 75
An Application of Kernel Regression in Health Studies 76
Application of Binary and Multinominal Logistic Regression in SPSS 77

Addressing Multicollinearity Via Modified Shewhart Chart in Monitoring Com-Poisson Profiles 78
Cusum and Ewma Charts for Identifying Anomalies in Com-Poisson Profiles under Multicollinearity 79
Factor Analysis for Construct Validity: An Applied Study 80
Determining the Effects and Removal Capacity of Malachite Green on Eggshells Using MANOVA 91
Analysis of by Some Non-Linear Mathematical Models the Number of Covid-19 Cases and Deaths in Macedonia 101
Prediction of Tobacco Production in Macedonia with Trend Analysis and Artificial Neural Networks 107
Unit Burr-Hatke Distribution with A New Quantile Regression Model 116
An Examination of the Performance of Logistic Regression and Artificial Neural Networks Algorithms from Machine Learning Methods on Disabled Employment Quota Method 117
Prediction of Tobacco Production in Macedonia with Trend Analysis and Artificial Neural Networks 118
Kümeleme Analizinde Kullanılan Yeni Bir Veri Görselleştirme Yaklaşımı 127
Essay on the Relationship Between Income Inequality and Inclusive Growth: Evidence From Morocco 134
Investigation of Gender in Turkey by Clustering Analysis on Provinces 135
Comparison of Liu, Ridge and Least Square Estimators on Relative Feed Value Estimation 136
Adaptation of S Test for Selection of Dependent Features with Ordered Patterns in High-Dimensional Data .. 137
An Evaluation of Supermarkets From the Lens of Multiple Criteria: The Intuitionistic Fuzzy TOPSIS Method 147
The Relation of the Intuitionistic Fuzzy Sets with Multi-Criteria Decision Making Methods 148
Parameter Estimation for Geometric Process with Exponential Distribution Under Censored Data 149
Partition of Pearson's Chi-Square Statistic to Its Components 150
Çok Kriterli Karar Verme Modellerinde AHP Yönteminin İncelenmesi 151
The Role of Clinical Significance, Statistical Significance, and Effect Size in Estimating the Minimum Required Sample Size 157
Millî Eğitim Bakanlığında Çalışan Rehber Öğretmenlerin Çocukları Tanımada Kullandıkları Tekniklerin Değerlendirilmesi 158
E-Picos Helps Handle the Challenge of Teaching Biostatistics 159
Comparison of Parameter Estimation Methods for the Kavya-Manoharan Exponential Distribution 160
Maximum Likelihood Estimation Based on Ranked Set Sampling of the Unit-Weibull Distribution 161
Robust and Efficient Estimation of Parameters in Regression Model: Application on Energy Data 162
Yazılım Maliyet Tahmininde Sık Kullanılan Veri Setlerinin İstatistiksel Olarak İncelenmesi ve Yapay Zekâ Yöntemleri ile Yapılan Yazılım Maliyet Tahmininde Kullanılan Değerlendirme Ölçütleri 163
(k,m)-type Slant Helices for Symplectic Curve in 4-Dimensional Symplectic Space 175
Determination of Impact Size by Canonic Correlation Analysis of the Factors Affecting the Buying or Selling Agricultural Lands 176
Some Properties of the Helices on De-Sitter Space **S13** 187
Determination of Agricultural Mechanization Level in Kahramanmaraş with Poission Regress By District 188
Modeling of Egg Weight, Width and Length Values in Partridges 198
Modeling Egg Curves in Partridges 204
Erlang Strength Against to Weibull Stress 209
Covid 19 Salgını Öncesinde ve Salgın Sürecinde Üniversite Öğrencilerinin Başarı Durumlarının Değerlendirilmesi 210
Exchange Rate Forecasting with Artificial Intelligence 211
Different Method for Appraisal on Functional Data Analysis 212
Three-factor experimental design as a tool in Applied Statistics 213
Implementation of Data Mining for the Purpose to Analyze Student's Decisions After High School 219
A Comparative Study of Artificial Neural Network, Gaussian Process Regression, response Surface Methodology Modeling Approaches for Predicting Amount of Corn Bread Phytic Acid 220
Using ROC Analysis with Propensity Score on PEG Feed Patients 221
On the Propagation of Uncertaininty in Parameter Estimation for Kinetic Models of Metabolism 222
Öznitelik Seçiminin Yazılım Maliyet Tahminine Etkisi ve Makine Öğrenmesi Tabanlı Yazılım Maliyet Tahmini Yapan Çalışmaların Karşılaştırmalı Analizi 223
Classification of Brain Tumors on MR Images Using Pixel-Based Segmentation and Machine Learning Methods 224
Contibution on the Links Between Socio-Economic Inequalities and Inclusive Growth (Evidence from Mena

Region)..... 225
Comparison of Bank Performances Using Multi-Criteria Decision Making Methods in the Perspective of COVID-19..... 237
Examining the Factors Affecting the Adoption of Financial Technologies (Fintechs)..... 238
G 20 Ülkelerinde Yaşam Kalitesinin CRITIC ve WASPAS Yöntemleri ile Karşılaştırılması..... 239
Investigation of Performance of J48 and Reptree Algorithms from Family of Decision Trees..... 240
Bütünleşik CRITIC ve ARAS Yöntemleri ile G7 Ülkelerinin Siber Güvenlik Performanslarının Karşılaştırılması..... 241
A Hybrid Structure for Classification of Brain Cysts Images..... 242
Kredi Hacmini Etkileyen Faktörlerin Yapay Sinir Ağları ile İncelenmesi..... 243
Çok Kriterli Karar Verme Modelleri: AHP ve Bulanık AHP Yöntem Karşılaştırması..... 244
Kızılırmak Havzasında Meteorolojik Kuraklık Analizi..... 251
Tokat Yöresi Topraklarının Bazı Özellikleri ile Aşınıma Duyarlılıklarının Karşılaştırılması..... 252
Working Covariance Selection Methods for Negative Binomial Marginal Model..... 261
Statistical Evidence of Crime..... 262
3*2 Lokus Modeli için Bağlantı Dengesizliği Katsayısının Örnekleme Dağılımı Üzerine Bir Simülasyon Çalışması..... 263
Harvest Efficiency of Chlorella sorokiniana Using a Vacuum Pump Chamber designed for Laboratory Conditions..... 264
Birliktelik Kuralları Algoritmaları ile Süt Sığırlarında Güç Doğumun İncelenmesi..... 272
Determination of Industrial Shelf System Selection Criteria Weights by SWARA Method..... 273
Evaluation of Inventory Management Data Storage Platform Selection Criteria with Analytical Network Process..... 274
Covid-19 Salgını Sonrası Sosyal İlişkilerde Sosyal Mesafeye Uyma Sosyal Çevreye Katılma ve Kamusal Alanda Bulunma Niyeti Üzerine Bir Araştırma..... 275
Koronavirüs Korkusu Sağlık Algısı ve Yaşam Doyumu Bağlamında Demografik Bir İnceleme..... 276
Test Day-Based Machine Learning Techniques for The Estimation of Norduz Sheep Live Weight..... 278
Using The Random Effect Negative Binomial Model and The Zero Inflated Negative Binomial Model to Examine Sheep Counts in Saray, Van..... 279
Using Content Analysis to Investigate Companies' Activities and Targets..... 280
Sales Forecast with Historical Data in a Shrinking Market..... 281
Some Remarks on BLUPs under Constrained Linear Models..... 282
Some Remarks on BLUPs and BLUEs under Constrained Linear Models..... 283
Climate Anxiety in Young People and Their Beliefs About Government Responses to Climate Change: A Scale Adaptation Study..... 290
Research on Workaholism and Burnout Syndrome in Textile Business Employees..... 291
Comparison of Environmental Performances of Cities in Central Anatolian Region Using Fucom and Grey Relational Analysis Methods..... 292
Statistical Indicators of the Physiological Changes in Daphnia Magna Exposed to Different Environmental Effects..... 303
Determination of Late Flowering Types in Almonds Using Multivariate Analysis Techniques..... 310
Longing for Sportive Success Scale: Validity and Reliability Study..... 311
Principal Components Analysis with Qualitative and Quantitative Variables (PCAmix)..... 312
Comparison of the Performance of Nominal Logistic Regression and Regression Trees Methods on Distance Education Dataset..... 313

Prediction of Tobacco Production in Macedonia with Trend Analysis and Artificial Neural Networks

Şenol Çelik[1*], Ehlinaz Torun Kayabaşı[2]

[1] Bingöl University, Faculty of Agriculture, Department of Animal Science, Department of Biometrics and Genetics, Bingöl-Turkey
[2] Kocaeli University Faculty of Agriculture Department of Agricultural Economics Kocaeli-Turkey

*Corresponding author e-mail: senolcelik@bingol.edu.tr

Abstract

Tobacco, constituting 3.2% of GDP in Macedonia, is an important agricultural product. Tobacco sector constitutes 3.9% of total agricultural production and 4.1% of employment in the sector. In this study, it is aimed to analyze and predict the amount of tobacco production in Macedonia using artificial neural networks (ANN) and trend analysis. In the development of ANN and trend analysis for the 1992-2020 period, the years parameter was used as the input parameter and the production amount was used as the output parameter. Linear, quadratic, cubic and exponential regression models were used in trend analysis. ANN analysis was carried out with the Hyperbolic Tangent activation function. Model criteria were developed by using statistics such as Mean Squares of Error (MSE) and coefficient of determination (R2). When trend analysis and ANN were compared, the least error squares mean (LCR) and the ANN method, which gave the largest R2 value, gave better results. A prediction for the period of 2021-2025 has been made with the ANN, and as a result of the prediction, it is expected that the amount of tobacco production will be 29405 tons in 2021, 29175 tons in 2022 and 28706 tons in 2025. It is expected that tobacco production will be in an increasing and decreasing course in the coming years. It has been seen that ANN models give better results than trend analysis in production modelling.

Key words: *Artificial Neural Network, Trend Analysis, Production, Tobacco*

INTRODUCTION

Tobacco is a member of the species whose scientific name is Nicotiana, which contains sixty-four genera from the nightshade family (Solanacease), and it is the name given to the leaves of the plants called Nicotiana tabacum and Nicotiana rustica, which are the most well-known in the world (Heiser, 1969).

The first journey of tobacco, known as the origin, was made from America to Europe with the ships belonging to Christopher Columbus and his friends (TEYO, 1978).

It is recorded that Columbus, who saw tobacco and tobacco leaves being smoked with sticks and chewed in the mouth for the first time in San Salvador on October 15, 1492, gave the name "tobacco" to the plant, where the locals smoked tobacco (Barış İzzettin, 1994).

Tobacco production is quite common in the Kocana district of Skopje, the capital of Macedonia. It is understood that relatively more products are obtained from tobacco and rice in the same unit area in Koçana. It can be stated that rice and tobacco, especially in the free trade environment that expanded in the 19th century, were subject to domestic trade and were exported, and in this context, they were capitalist products produced in the region (Karaduman and Tabakoğlu, 2021).

According to the data of FAO (Food and Agriculture Organization of the United Nations) for 2020, the country with the highest tobacco production in the world is China with 2 135 263 tons. India is in the second place with 761 335 tons and Brazil is in the third place with 702 208 tons. These countries were followed by Zimbabwe, Indonesia, United States of America, Mozambique, Pakistan, Argentina and Malawi, respectively, and ranked in the top 10 in the world. Turkey ranks 14th with a production amount of 76 540 tons, while Macedonia ranks 26th with a production of 26 112 tons (FAO, 2020).

The factors affecting the amount of tobacco production in the Black Sea Region during the 1990-2003 period were examined with the Latent Regression model. Cultivation area, yield, temperature, humidity and precipitation were found to be important independent variables affecting production. The price did not make a significant contribution to the model (Terzi et al., 2009).

In the study conducted by Dikmen (2005), the relationship between tobacco production and price in Turkey in the 1982-2003 period was examined with the Koyck model.

In this study, it is aimed to model and predict the amount of tobacco production in Macedonia with artificial neural networks and trend analysis.

MATERIAL AND METHOD

Material

The data used in the study consisted of tobacco production data under the title of "Crops and livestock products" compiled from the www.fao.org website of the Food and Agriculture Organization of the United Nations (FAO). Data from 1992 to 2020 were used in the study and analyzed with artificial neural networks (ANN) and trend analysis. After the appropriate models were determined, the number of ducks for the period 2021-2025 was predicted.

Method

Trend analysis

Least Squares (Least Squares) Method

The functional relationship between time and observation values can be linear or non-linear. The obtained function must be in line with the line or time series graph. Moreover,

Y_t: Observation values, $\widehat{Y_t}$: Trend values (theoretical values),

$$\sum_{t=1}^{n}\left(Y_t - \widehat{Y_t}\right)^2 = min$$

condition must be met. In order to apply the EKK method, the time series graph must first be drawn. The most suitable function type for the development direction of this graph is selected (Serper, 2004). Some trend models used in the EKK method are linear, quadratic and cubic models.

Linear regression model,

$$Y_i = b_0 + b_1 X_i + \varepsilon_i$$

(Gujarati, 2003; Kadilar, 2009). Normal equations of the linear regression model

$$\sum_{t=1}^{n} Y_t = nb_0 + b_1 \sum_{t=1}^{n} X_t$$

$$\sum_{t=1}^{n} X_t Y_t = b_0 \sum_{t=1}^{n} X_t + b_1 \sum_{t=1}^{n} X_t^2$$

and b_0 and b_1 parameters are estimated by solving this system of equations (Gamgam and Altunkaynak, 2015).

Quadratic regression model,

$$Y_i = b_0 + b_1 X_i + b_2 X_i^2 + \varepsilon_i$$

(Akkaya, 1990).

Cubic regression model,

$$Y_i = b_0 + b_1 X_i + b_2 X_i^2 + b_3 X_i^3 + \varepsilon_i$$

(Montgomery et al., 2012).

Artificial Neural Networks (ANN)

Artificial neural networks (ANNs) learn and generalize by experimentation. Predicting the future is one of the important areas that can be used with ANN. Revealing complex relationships between data can be done with ANN. ANN performs well in learning, optimization, analysis, classification, generalization and association (Öztemel, 2012).

ANN is a very fast definition and understanding of information data, which is usually created in very different ways. It performs non-linear modeling without the need for any prior knowledge and assumptions between input and output variables (Kaastra & Boyd, 1996).

The smallest units that form the basis of ANN's work are called artificial nerve cells. The artificial neuron has five main components. These components are inputs, weights, summation function, activation function and output components.

Inputs consist of information coming from the outside world to an artificial neuron. Information received from the outside world is transferred to artificial nerve cells as input (Özveren, 2006).

Weights express the effect of information coming into an artificial cell on a neuron (Öztemel, 2012). The weights are the coefficients that show the effect of the inputs received through the artificial nerve on the nerve and are expressed with (w1, w2, w3,…, wi) (Elmas, 2003). The addition function calculates the net input to a cell. This function is formulated as follows.

$$z_i = \sum_{i=1}^{n} (w_{ij}\, x_i + b_j)$$

Where w is the inputs, x is the weights, and n is the number of inputs (process elements).

The value obtained using the sum function and the output of the processing element passed through a linear or non-linear differentiable activation function are expressed as follows (Yavuz and Deveci, 2012).

$$y = f(z_i) = f\left(\sum_{i=1}^{n} (w_{ij}\, x_i + b_j)\right)$$

Activation function

Activation function is one of the important factors determining neuron behavior (Efe and Kaynak, 2000). In ANN, the output amplitude of the neuron is limited between the desired values. It generally consists of values between [-1, 1] (Sagiroglu et al., 2003).

The Hyperbolic tangent activation function was used as the activation function.

Hyperbolic tangent activation function,

$$F(NET) = \frac{e^{NET} - e^{-NET}}{e^{NET} + e^{-NET}}$$

(Öztemel, 2012; Alp and Öz, 2019). The output values of the hyperbolic tangent activation function are in the range of -1 to 1 (Çayıroğlu, 2015).

Back propagation algorithm selection

Important problems in ANN method are solved by back propagation algorithm. In the back propagation network, the errors of the units in the intermediate layers are determined by backpropagation of the errors of the units in the output layer. For this reason, the method is named as Back Propagation Learning Algorithm. In the back propagation algorithm, more than one non-linearity-free output unit can be used with the sigmoidal transfer function. Output units can generate real numbers in the range of [-1,1] (Kröse and Smagt, 1996).

Model suitability criteria

ANN model performance is usually determined by Mean Error Squares (MSE) and Mean Absolute Error (MAE). MSE is calculated as follows (Singh et al., 2009).

$$MSE = \frac{\sum_{i=1}^{n}\left(Y_i - \hat{Y}_i\right)^2}{n}$$

MAE is calculated as follows.

$$MAE = \frac{\sum_{i=1}^{n}\left|Y_i - \hat{Y}_i\right|}{n} = \frac{\sum_{i=1}^{n}|\varepsilon_i|}{n}$$

Burada Y_i: Observed values of the dependent variable, $\hat{Y}$: Estimated values of the dependent variable, n is the number of observations.

RESULTS

The trend analysis of the amount of sainfoin production between 1992 and 2020 in Macedonia was examined. Linear, quadratic and cubic regression analysis were applied. In order to determine the most suitable model, the model with the largest coefficient of determination (R^2) value was evaluated (Table 1).

Table 1. Equation, R^2 and MSE values of the models

Model	Equation	R^2	MSE
Linear	Yt = 21788 +158.99*t	0.113	14799387.664
Quadratic	Yt = 21519 +210.96*t -1.7322*t**2	0.114	15355522.183
Cubic	Yt = 22858 -283.04*t +38.744*t**2 -0.89948*t**3	0.125	15773673.826

In the trend analysis methods in Table 1, the R^2 values of all methods are very low. ANN method was also used to better model the production forecast. The numbers of ANN input, hidden and exit layers were determined as 1-12-1, respectively, and were applied with back propagation learning with 1000 iterations. For ANN, R^2=0.9746, MSE=673530.829 and MAE=697.137. Since MSE value is smaller and R^2 value is larger for ANN method than trend analysis methods, ANN is the most appropriate method to be used.

The graph of the values of tobacco production in Macedonia between 1992 and 2020 is presented in Figure 1.

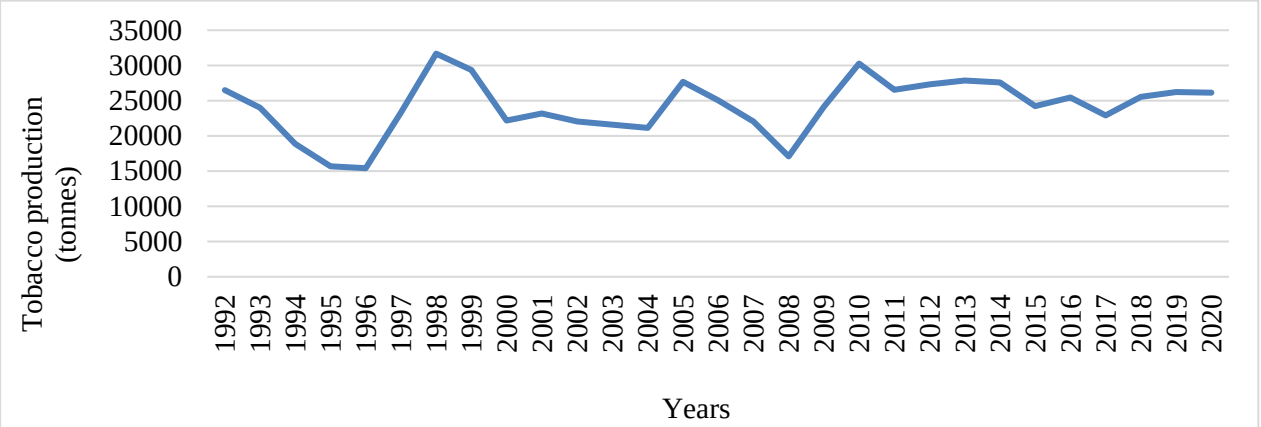

Figure 1. Tobacco production in Macedonia between 1992 and 2020

When Figure 1 is examined, a fluctuating course was observed in tobacco production in the 1992-2020 period. However, since 2011, a lower level of ups and downs has been observed. In the period after 2011, tobacco production was between 22885-27859 tons. The residual values along with the predicted and observed values when ANN was applied are given in Table 2.

Table 2. Observed, estimated and residual values (residual)

Years	Actual	Predicted	Residual
1992	26502	NaN NaN	
1993	24002	NaN NaN	
1994	18862	NaN NaN	
1995	15683	NaN NaN	
1996	15412	NaN NaN	
1997	23308	NaN NaN	
1998	31676	NaN NaN	
1999	29368	NaN NaN	
2000	22175	NaN NaN	
2001	23200	NaN NaN	
2002	22044	NaN NaN	
2003	21592	NaN NaN	
2004	21140	21823.4844	-683.4844
2005	27691	26299.5857	1391.4143
2006	25036	24730.7041	305.2959
2007	22056	22069.5270	-13.5270
2008	17087	18286.4362	-1199.4362
2009	24122	24533.9034	-411.9034
2010	30280	28841.1210	1438.8790
2011	26537	27538.6069	-1001.6069
2012	27333	27180.3069	152.6931
2013	27859	27658.0101	200.9899
2014	27578	28162.0766	-584.0766
2015	24237	23362.5207	874.4793
2016	25443	24655.7809	787.2191
2017	22885	24088.2633	-1203.2633
2018	25547	26340.8852	-793.8852
2019	26234	26442.6467	-208.6467
2020	26112	25511.4712	600.5288

The graph of the actual and estimated values as a result of the ANN application is given in Figure 2, and the graph of the residual values is given in Figure 3.

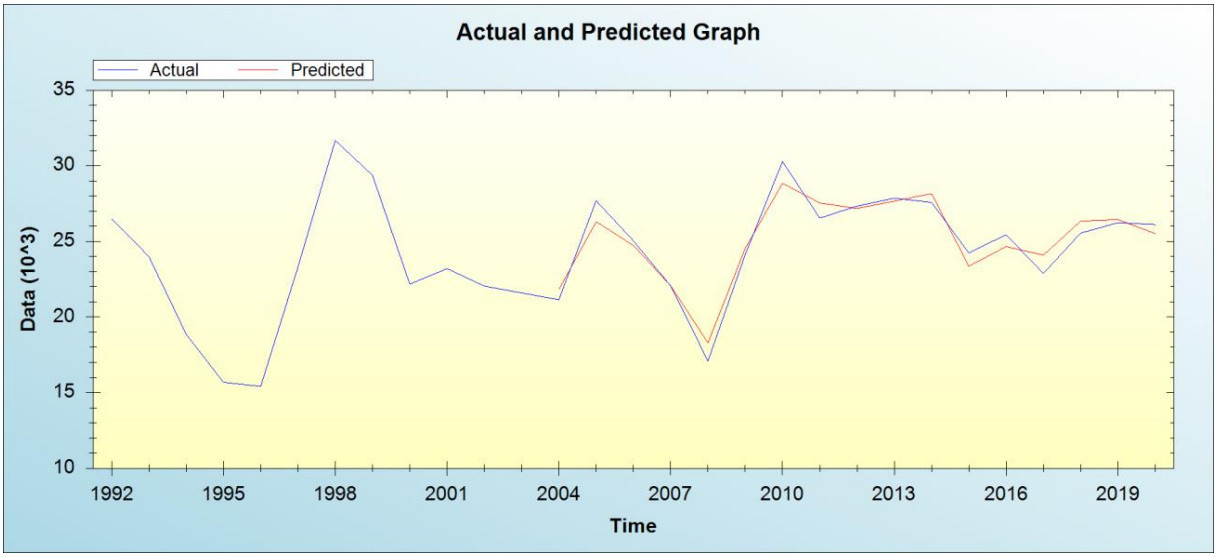

Figure 2. Graph of observed and predicted values together

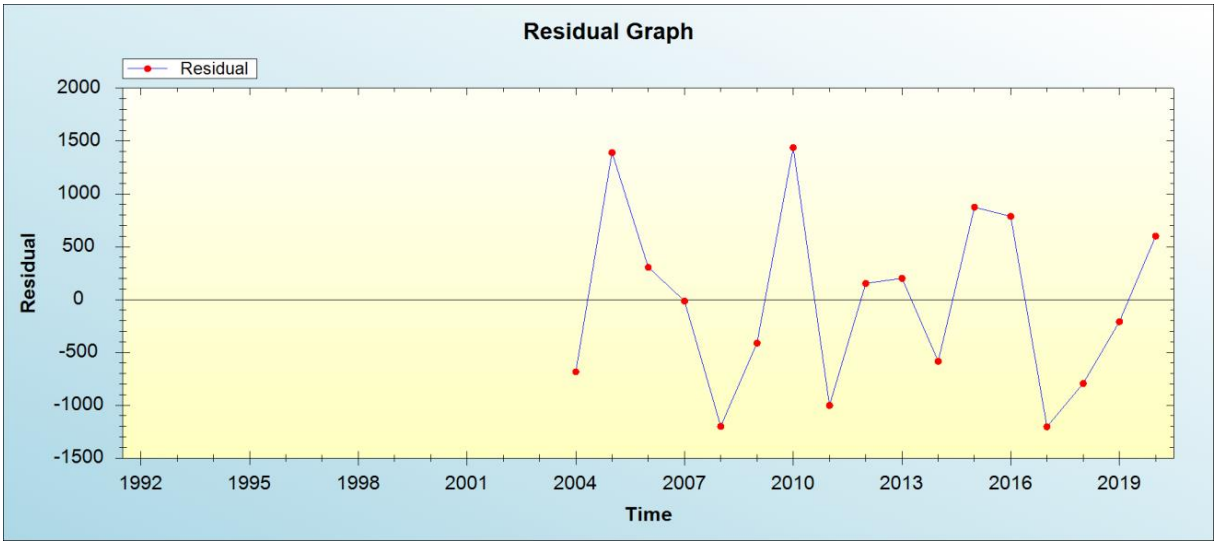

Figure 3. Graph of residuals

When the graph of the residual values in Figure 3 is examined, it is seen that the residual values are independently and randomly distributed. This shows that the important hypotheses of the model are met. The graph of the observed and residual values is presented in Figure 4.

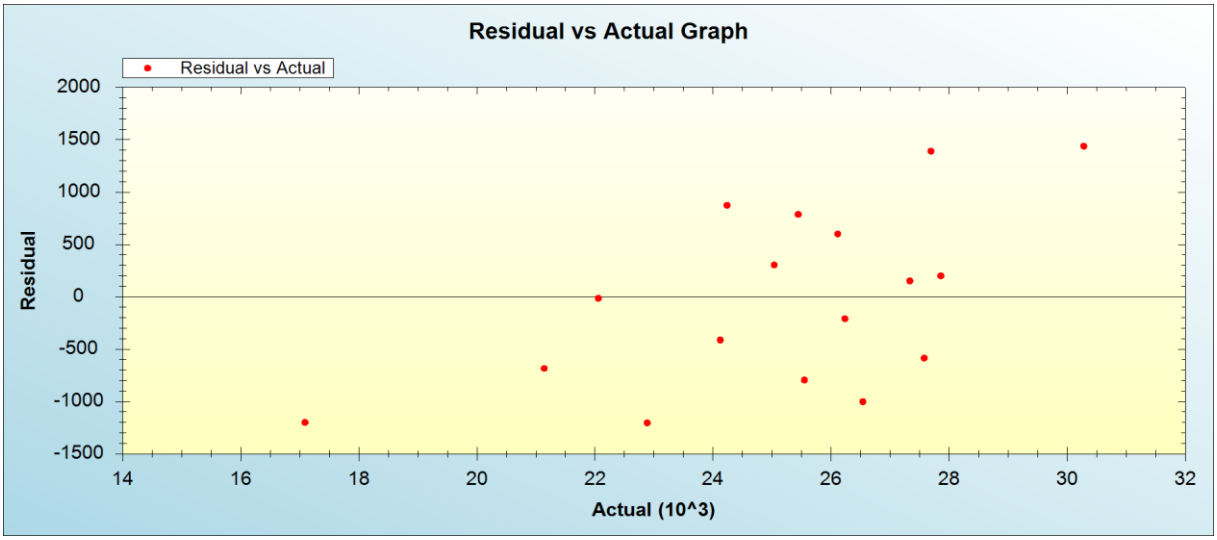

Figure 4. Graph of observed and residual value

Tobacco production projections for the 2021-2025 period are given in Table 3 and Figure 5.

Table 3. Production forecast for future years

Years	Forecast
2021	29404.56
2022	29174.73
2023	29821.13
2024	28293.05
2025	28705.97

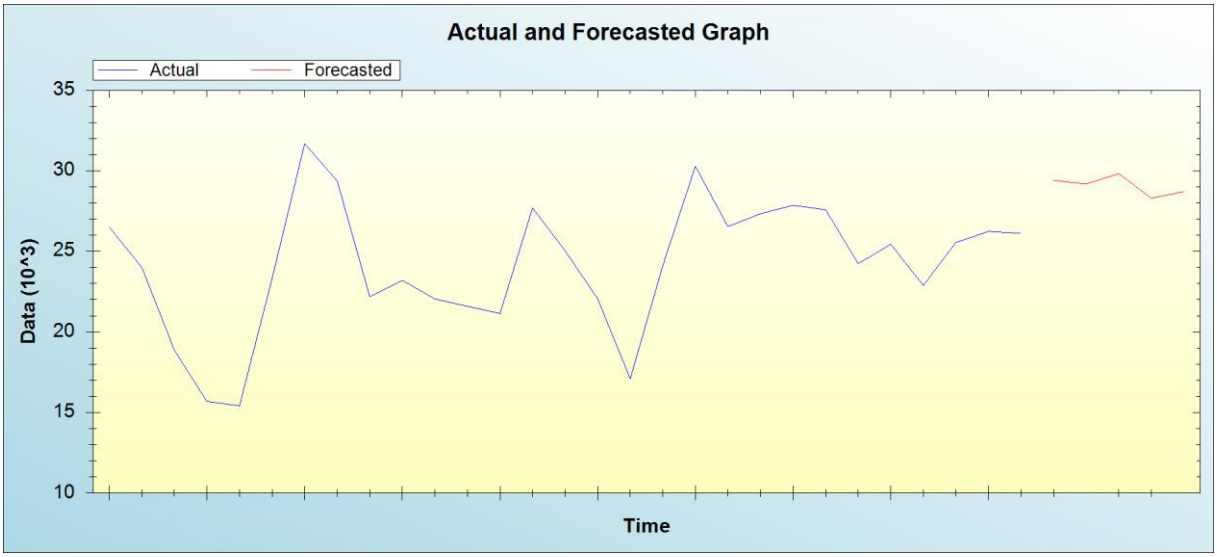

Figure 5. Observed values by years and forecast for the next period

According to the prediction results given in Table 3, it is expected that the amount of tobacco production will increase and decrease, and the production amount values will be close to each other.

DISCUSSION AND CONCLUSION

In one of the studies with agricultural data, Grzesiak et al. (2010) identified the problematic cows in artificial insemination using artificial neural networks and MARS algorithms and showed the elimination of risky ones. Cows are divided into two groups, good and bad. Specific variables were used to identify cows with problems in artificial insemination. In both methods, the most important determining variable is calving interval.

Grzesiak et al. (2003) used artificial neural networks and multiplexes to estimate the 305-day milk yield average, the number of days at milking, the average milk yield in the 1st, 2nd, 3rd, 4th periods and the effect of calving month on milk yield in Holstein-Friesian cows in a barn (2003). used a regression model. The authors explained that artificial neural networks are more suitable for milk prediction.

In the study of Çelik (2021), artificial neural networks and time series analysis were applied to estimate the number of camels in Turkey. For the 1961-2020 period, a network of 1000 iterations with 12 hidden layers, 12 processing elements (12-12-1) and Levenberg–Marquardt back propagation algorithm (trainlm) was established and analyzed. As a result of the analysis, the prediction of the number of camels between 2021 and 2025 was obtained and it is expected that the number of camels will show a fluctuating course in this period.

In this study, the amount of tobacco production in Macedonia was modeled with artificial neural networks. Years (1992-2020) are used as input variable and production amount is used as output variable. Hyperbolic tangent functions from activation functions were used.

The results revealed that the established ANN method gives good predictions. The low MSE and MAE values in the training, testing and validation stages also show this.

As a result of the ANN analyzed using the hyperbolic tangent function, it is expected that the tobacco production in Macedonia will be between 28293 tons and 29405 tons in the 2021-2025 period. In 2024-2025, the amount of tobacco production in Macedonia is expected to decrease, albeit slightly. It is hoped that it will give good results in agricultural data by using artificial neural networks and alternative techniques in future forecasting studies.

References

Akkaya, Ş. 1990. Ekonometri I. Anadolu Matbaacılık, İzmir.

Alp S., Öz E. 2019. Makine öğrenmesinde sınıflandırma yöntemleri ve R uygulamaları. Nobel Akademik Yayıncılık, Ankara.

Barış İzzettin, ed. 1994. Sigara ve sağlık. 1inci baskı. Ankara: MEB yayınları, 11-14

Çayıroğlu, İ. 2015. İleri Algoritma Analizi-5 Yapay Sinir Ağları http://www.ibrahimcayiroglu.com/Dokumanlar/IleriAlgoritmaAnalizi/IleriAlgoritmaAnalizi-5.Hafta-YapaySinirAglari.pdf

Çelik Ş. 2021. Modeling and estimation of camel population in Turkey with time series analysis and Artificial Neural Networks. International Journal of Research in Engineering and Science (IJRES), 9(5):38-44

Dikmen, N. 2005. Koyck-Almon Yaklaşımı İle Tütün Üretimi ve Fiyat İlişkisi. VII. Ulusal Ekonometri ve İstatistik Sempozyumu, 26-27 Mayıs 2005, İstanbul Üniversitesi. http://www.ekonometridernegi.org/bildiriler/o16s1.pdf, Accessed to: Ağustos 2006.

Efe Ö., Kaynak O. 2000. Yapay sinir ağları ve uygulamaları, Boğaziçi Üniversitesi Yayını, İstanbul

Elmas Ç. 2003. Yapay sinir ağları, Birinci Baskı, Seçkin Yayıncılık, Ankara

FAO, 2020. Food and Agriculture Organization of the United Nations. Crops and livestock products. https://www.fao.org/faostat/en/#data/QCL (Accessed to: 21.05.2022).

Gamgam, H., Altunkaynak, B. 2015. SPSS Uygulamalı Regresyon Analizi. Seçkin Yayıncılık, Ankara.

Grzesiak W., Lacroix R., Wójcik J., Blaszczyk P. 2003. A comparison of neural network and multiple regression prediction for 305-day lactation yield using partial lactation records. Canadian Journal of Animal Science, 83:307-310.

Grzesiak W., Zaborski D., Sablik P., Zukiewicz A., Dybus A., Szatkowska I. 2010. Detection of cows with insemination problems using selected classification models. Computers and Electronics in Agriculture, 74(2): 265-273

Gujarati, D. N. 2003. Basic Econometrics. McGraw-Hill, North America.

Heiser, C.B. 1969. Night shades: The Paradoxical Plants, San Francisco, s.12-13.

Kaastra I., Boyd M. 1996. Designing a neural network for forecasting financial and economic time series. Neurocomputing, 10: 215-236

Kadılar, C. 2009. SPSS Uygulamalı Zaman Serileri Analizine Giriş. Bizim Büro Yayınevi, Ankara.

Karaduman, G., Tabakoğlu, A. 2021. 19. Yüzyıl Temettuat Defterleri'ne Göre Üsküp/Koçana Kazası'nın Lorenz Eğrisi ve Gini Katsayısı ile Gelir Dağılımının Analizi. Eskişehir Osmangazi Üniversitesi İİBF Dergisi, 16(1): 146-165. Doi: 10.17153/oguiibf.860980

Kröse, B., Smagt, P. V. D. 1996. An Introduction to Neural Networks. Eight Ed., The University of Amsterdam.

Montgomery, D.C., Peck, E.A., Vining, G.G. 2012. Introduction to Linear Regression Analysis. John Wiley and Sons, Inc., USA.

Öztemel E. 2012. Yapay sinir ağları. Papatya Yayıncılık, İstanbul.

Özveren, U. 2006. Pem Yakıt Hücrelerinin Yapay Sinir Ağları ile Modellenmesi. Yayınlanmamış Yüksek Lisans Tezi, Yıldız Teknik Üniversitesi Fen Bilimleri Enstitüsü, İstanbul

Sağıroğlu, Ş., Beşdok E., Erler M. 2003. Mühendislikte yapay zeka uygulamaları-I Yapay Sinir Ağları, Ufuk Kitap Yayıncılık.

Serper, Ö. 2004. Uygulamalı İstatistik 2. Ezgi Kitabevi, Bursa.

Singh KP., Basant, A, Malik A, Jain G. 2009. Artificial neural network modeling of the river water quality-A case study. Ecological Modelling, 220(6): 888-895.

Terzi, E., Şenel, T., Terzi, Y., Cengiz, M.A. 2009. Latent Regresyon Modellerin Gerçek Veri Kümesine Uygulaması. e-Journal of New World Sciences Academy, 4(4): 104-109. Article Number: 3A0013

Tütün Eksperleri Yüksek Okulu. 1978. Tütüncülüğe giriş. İstanbul: TEYO yayını, 918

Yavuz, S., Deveci, M. 2012. İstatistiksel Normalizasyon Tekniklerinin Yapay Sinir Ağı Performansına Etkisi. Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 40: 167-187