



Economic Performance of Modern Tobacco Production in the Republic of North Macedonia

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ABSTRACT

This paper examines the economic performance of modern tobacco production in the Republic of North Macedonia, a country with a long-standing tradition in tobacco cultivation. The study investigates the profitability and sustainability of current tobacco farming practices amidst a dynamic global market and evolving regulatory environment. Utilizing a mixed-methods approach, this research analyzes data on production costs, yields, labor inputs, and market prices to assess the economic viability of tobacco farming in the region. The findings reveal that while technological advancements and improved farming techniques have the potential to enhance productivity and reduce costs, the sector faces significant challenges, including high labor expenses, fluctuating international demand, and competitive pressures from other tobacco-producing countries. Additionally, the paper explores the impact of government policies and international trade agreements on the economic outcomes for tobacco farmers. Strategic investment in modernization, coupled with supportive policies and market diversification, is essential for maintaining the profitability and sustainability of tobacco production in North Macedonia. These insights provide valuable guidance for policymakers, producers, and industry stakeholders aiming to strengthen the economic foundations of the tobacco sector in a rapidly changing global context.

Keywords: Tobacco production; Economic performance; Modern agriculture; Agricultural economics; Sustainable farming practices; Economic impact

INTRODUCTION

Tobacco production has been the cornerstone of the agricultural sector in the Republic of North Macedonia for centuries, playing a vital role in the national economy and contributing significantly to rural employment. As one of the country's primary exports, tobacco has long been a source of economic stability, especially for small farmers in rural areas. The importance of the sector is highlighted by its contribution

to Gross Domestic Product (GDP), foreign exchange earnings and employment. However, the tobacco industry is currently at a crossroads, facing numerous challenges such as market volatility, rising production costs, and growing regulatory pressures from public health policies aimed at reducing tobacco consumption.

In recent years, there has been a notable shift towards modernizing tobacco production practices in North Macedonia. Farmers are increasingly adopting advanced

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agricultural technologies and sustainable practices to improve crop yield and quality, reduce costs, and improve overall economic performance. This modernization process includes the use of high-quality seeds, improved irrigation techniques and mechanization, all aimed at increasing efficiency and profitability [1]. Despite these advances, the economic sustainability of tobacco production remains a complex issue, influenced by fluctuating market prices, high input costs and international competition.

The purpose of this paper is to provide a comprehensive analysis of the economic performance of modern tobacco production in North Macedonia. By examining cost structures, yield dynamics, market conditions and the impact of government policies and international trade agreements, this paper aims to provide an overview of the current state of the industry and its future prospects. This paper offers insights that can inform policy makers, farmers and other stakeholders about the opportunities and challenges facing the tobacco sector in North Macedonia, which will ultimately contribute to strategies for sustainable development and economic resilience.

MATERIALS AND METHODS

This review paper aims to systematically analyze the existing literature on the economic performance of modern tobacco production in the Republic of North Macedonia [2]. The focus is on evaluating the economic aspects of tobacco production, including profitability, production efficiency, and market dynamics, as reported in various academic, government, and industry publications.

A comprehensive literature search was conducted to collect relevant studies, reports and articles. The following databases and sources were used:

Academic databases: The search included Scopus, Web of Science, PubMed, and Google Scholar to identify peer-reviewed articles and papers.

Government reports and publications: The reports from the State Statistics Office of North Macedonia, the Ministry of Agriculture, Forestry and Water Management and the Scientific Tobacco Institute Prilep were reviewed. These documents provided valuable insights into national tobacco production statistics, economic performance and policy frameworks.

Industry reports and market analysis: Reports from industry organisations, including tobacco associations and market research firms, were included to understand the commercial aspects and market dynamics of the tobacco sector in North Macedonia.

A comparative analysis was performed to identify patterns, trends and gaps in the existing literature, providing a comprehensive overview of the economic performance of contemporary tobacco production in North Macedonia.

Overview of Global Tobacco Production Trends

Global tobacco market dynamics: The global tobacco market is characterized by its complex dynamics, influenced by economic, social, and regulatory factors. Despite declining smoking rates in many developed countries due to increased awareness of health risks and stringent anti-smoking regulations, global tobacco production remains substantial. This is primarily due to the rising demand in developing and emerging markets, where tobacco consumption continues to grow. Factors such as population growth, economic development, and the cultural acceptance of smoking contribute to the sustained demand for tobacco products in these regions.

Global tobacco production is also shaped by supply-side dynamics, including advancements in agricultural practices, changes in production costs, and shifts in trade policies. The introduction of modern farming techniques and technologies has led to increased productivity and efficiency in tobacco cultivation. However, the industry also faces challenges such as fluctuating commodity prices, rising labor costs, and the impact of climate change on crop yields. Moreover, international trade policies, including tariffs, subsidies, and trade agreements, play a significant role in determining the competitiveness of tobacco producers on the global stage [3].

Tobacco production in the Republic of North Macedonia: Tobacco production in the Republic of North Macedonia has a long and historical history, deeply intertwined with the cultural and economic fabric of the country. Dating back to the Ottoman period, tobacco cultivation became a significant agricultural activity due to the region's favorable climate and soil conditions. The introduction of oriental varieties of tobacco, especially the aromatic and high-quality types, positioned North Macedonia as a key player in the Balkan tobacco trade. Over time, tobacco emerged as one of the country's primary agricultural products, contributing significantly to the national economy.

During the 20th century, especially in the socialist era, tobacco production was heavily regulated and supported by the state. During this period, large tobacco cooperatives and state-owned enterprises were established that controlled the cultivation, processing and marketing of tobacco. The industry has provided significant employment opportunities, particularly in rural areas, and has become a major source of income for many farming households. Tobacco exports have also become an important contributor to foreign exchange earnings, cementing the crop's status as a vital component of the agricultural sector in North Macedonia.

After the country's independence in 1991, the tobacco industry underwent significant transformations. The liberalization of the economy, combined with the privatization of state-owned enterprises, led to a market-oriented approach to tobacco production. Despite these changes, tobacco remains a critical part of the agricultural economy, accounting for a significant portion of the country's agricultural GDP. The industry continues to provide employment for thousands of people, especially in rural

regions where alternative economic opportunities are limited. However, the sector faces ongoing challenges, including fluctuating global demand, competition from other tobacco-producing countries and increasing regulatory pressures aimed at reducing tobacco consumption [4].

Tobacco production in the Republic of North Macedonia focused on various aspects of the industry, including its economic impact, production practices and market dynamics. In particular, the importance of tobacco as a cash crop for rural households should be highlighted, highlighting its role in providing income stability and livelihood support, with findings suggesting that modernization and adoption of improved agricultural practices can improve yield and profitability.

Overall, the previous research highlights the complexity of tobacco production in North Macedonia, emphasizing the need for a balanced approach that takes into account economic, social and environmental factors. As the country continues to navigate the challenges of a changing global market and evolving regulatory landscape, ongoing research will be critical to inform policy decisions and support the development of a resilient and sustainable tobacco industry.

Economic Aspects of Tobacco Production

The role of tobacco in the agricultural economy: Tobacco production plays a significant role in the agricultural economy, especially in countries where it serves as a major cash crop. In many emerging and developing economies, tobacco is a key component of the agricultural sector due to its relatively high value per hectare compared to other crops. This makes it an attractive option for farmers, especially in regions where alternative income opportunities are rare or less profitable.

In the Republic of North Macedonia, tobacco is the cornerstone of the agricultural economy. The crop contributes significantly to agricultural Gross Domestic Product (GDP) and provides a vital source of income for numerous rural households. Tobacco farming is labor intensive, creating employment for large numbers of individuals in planting, growing, harvesting and processing. This has a multiplier effect on the local economy, stimulating growth in related sectors such as transport, manufacturing and retail.

In addition, tobacco production plays a key role in the country's export economy. North Macedonian tobacco, especially the oriental varieties known for their specific taste and aroma, is highly valued in international markets. Exports of tobacco products generate significant foreign exchange earnings, helping to balance trade deficits and support the country's economic stability.

Profitability and Economic Sustainability of Tobacco Production

Profitability of tobacco production: The profitability of tobacco production is a complex issue that varies depending on several factors, including farm size, production practices, regional conditions, market access, and the regulatory environment. In many tobacco-producing regions, including

the Republic of North Macedonia, tobacco has traditionally been one of the most profitable cash crops due to its high market value and consistent demand. The profitability of tobacco production often makes it a preferred choice for farmers, especially in rural areas where alternative income-generating opportunities are limited [5].

RESULTS AND DISCUSSION

Factors Affecting Profitability

Yield and quality: Higher yields and better-quality tobacco leaves directly translate into increased revenue for farmers. Factors such as soil fertility, climate conditions, and the use of high-quality seeds play a crucial role in determining both yield and quality. For example, in North Macedonia, oriental tobacco varieties are known for their unique flavor and aroma, making them highly valued in international markets. This premium quality can enhance profitability, especially for farmers who employ careful cultivation and curing techniques.

Production costs: The cost structure of tobacco farming includes inputs such as seeds, fertilizers, pesticides, labor, and equipment. Effective management of these costs is critical for maintaining profitability. For instance, adopting modern farming practices such as mechanization and efficient irrigation systems can reduce labor costs and increase productivity. However, rising input costs, particularly for fertilizers and labor, can erode profit margins, making cost management a key focus for farmers.

Market prices: Tobacco prices are influenced by global supply and demand dynamics, trade policies, and competition from other tobacco-producing countries. Farmers in North Macedonia and elsewhere must navigate these market conditions to maximize profitability. Price fluctuations can significantly impact revenue, making it essential for producers to have access to timely market information and to diversify their market outlets whenever possible.

Government policies: In many tobacco-producing countries, including North Macedonia, government policies play a significant role in shaping the profitability of tobacco farming. Subsidies, price supports, and trade policies can provide stability and encourage production. However, policies aimed at reducing tobacco consumption for public health reasons, such as increased taxes and stricter regulations, can also impact profitability by reducing demand.

Economic Sustainability of Tobacco Production

While profitability is a crucial concern for tobacco farmers, economic sustainability encompasses a broader set of factors that ensure the long-term viability of the industry. Economic sustainability in tobacco production involves maintaining profitability over time while minimizing adverse social, environmental, and economic impacts.

Key Aspects of Economic Sustainability

Environmental impact: Tobacco farming can have significant environmental consequences, including soil degradation, deforestation, and water pollution. Sustainable practices, such as crop rotation, organic farming, and reduced pesticide use, can mitigate these impacts and promote long-term soil health and ecosystem stability. In North Macedonia, efforts to promote sustainable tobacco production have focused on improving water management and reducing the use of chemical inputs.

Social and economic impact: Tobacco production is labor-intensive, providing employment and income to many rural households. However, the industry also faces challenges related to labor conditions, particularly for smallholder farmers who may have limited access to resources and market information. Ensuring fair labor practices and improving farmers' access to credit, education, and technology are essential for the social sustainability of the industry.

Diversification and risk management: Economic sustainability also involves diversifying income sources to reduce dependence on tobacco and manage risks associated with market volatility and regulatory changes. Diversification can include integrating other crops or agricultural activities, such as livestock farming or agro-tourism, to provide alternative income streams. In North Macedonia, there have been initiatives to encourage farmers to diversify their production base, thereby enhancing resilience to external shocks [6].

Adaptation to market and policy changes: The tobacco industry is subject to shifting global market trends and evolving regulatory landscapes aimed at reducing tobacco consumption and addressing health concerns. For the industry to remain economically sustainable, it must adapt to these changes by improving productivity, reducing costs, and exploring new market opportunities. In North Macedonia, adapting to these changes includes aligning production practices with European Union standards and exploring export opportunities in non-traditional markets.

Achieving both profitability and economic sustainability in tobacco production requires a multifaceted approach that balances short-term economic gains with long-term viability. By addressing environmental, social, and economic challenges, stakeholders in the tobacco industry can work towards a more sustainable and resilient future.

Modern Agricultural Practices in Tobacco Cultivation

Advances in farming techniques

Modern agricultural practices in tobacco cultivation have evolved significantly, driven by the need to enhance productivity, improve quality, and ensure sustainability. These advancements encompass a range of techniques and approaches that aim to optimize various aspects of tobacco farming.

Precision agriculture: Precision agriculture involves the use of advanced technologies to monitor and manage crops more effectively. Techniques such as GPS-guided machinery,

variable rate application of fertilizers and pesticides, and soil moisture sensors enable farmers to apply inputs more accurately, reducing waste and enhancing crop yield. In tobacco farming, precision agriculture helps optimize resource use, manage soil health, and improve overall productivity [7-9].

Integrated Pest Management (IPM): IPM is a holistic approach to pest control that combines biological, cultural, physical, and chemical methods to manage pest populations while minimizing environmental impact. In tobacco cultivation, IPM strategies include the use of pest-resistant tobacco varieties, crop rotation, and the application of targeted pesticides only when necessary. This approach helps reduce reliance on chemical inputs and minimizes harm to beneficial organisms.

Soil management and conservation: Modern tobacco farming emphasizes soil health and conservation practices to maintain soil fertility and prevent erosion. Techniques such as reduced tillage, cover cropping, and organic amendments contribute to improved soil structure and nutrient content. These practices help sustain long-term soil productivity and reduce the environmental impact of tobacco cultivation.

Water management: Efficient water management is crucial for optimizing tobacco growth and reducing water usage. Technologies such as drip irrigation and soil moisture monitoring systems allow for precise water application, minimizing waste and ensuring that plants receive adequate moisture. Improved irrigation practices help enhance tobacco yield and quality while conserving water resources.

Genetic improvement: Advances in plant breeding and genetics have led to the development of tobacco varieties with enhanced traits such as disease resistance, improved yield, and better leaf quality.

The Impact of Technology and Innovation

Technology and innovation have had a major impact on tobacco farming, transforming traditional farming practices and driving significant improvements in efficiency and sustainability.

Automation and mechanization: The adoption of automated machinery and mechanized processes has revolutionized tobacco cultivation. Modern equipment, such as mechanical harvesters and automated curing systems, reduces labor requirements and increases operational efficiency. Mechanization enables more consistent and timely harvesting, reducing the risk of crop losses and improving overall productivity.

Data analytics and decision support systems: The integration of data analytics and decision support systems in tobacco farming has improved farmers' ability to make informed decisions. Tools such as weather forecasting, crop modeling, and yield forecasting software provide valuable insights into optimal planting times, input application rates, and harvest schedules. These technologies help farmers optimize their

operations and respond more efficiently to changing conditions.

Biotechnology and crop protection: Biotechnology has introduced innovative solutions for crop protection and improvement. In addition, advances in biological control agents and plant growth regulators contribute to more sustainable and targeted pest management.

Sustainable practices and certification: The adoption of sustainable practices and certification programs has become increasingly important in tobacco farming. Sustainable agricultural practices, such as those promoted by certification programs such as the Rainforest Alliance and GlobalGAP, focus on environmental stewardship, social responsibility and economic viability. Certification helps farmers access premium markets, meet regulatory requirements and demonstrate their commitment to sustainability.

Digital platforms and connectivity: Digital platforms and connectivity have facilitated knowledge exchange and collaboration among tobacco farmers. Online resources, mobile apps and social media platforms provide access to

best practices, technical support and market information. These digital tools allow farmers to stay updated on the latest developments in tobacco farming and connect with industry experts and peers.

Modern agricultural practices and technological innovations have greatly advanced tobacco cultivation, leading to improved productivity, efficiency and sustainability. By embracing these advances, tobacco farmers can improve their operations, address environmental challenges, and respond to evolving global market demands.

Detailed analysis of tobacco production in north Macedonia

The **Table 1** provided contains data on the harvested area, the number of tobacco producers, and the average area per producer in North Macedonia from 2015 to 2021. The analysis explores trends, implications, and possible reasons behind these figures.

Table 1: Areas and producers of tobacco in the Republic of North Macedonia.

Harvest	Planted area in ha	Number of manufacturers	Average area per producer, ha
2015	14171	24234	0,58
2016	13958	23438	0,6
2017	14412	23373	0,62
2018	14505	23426	0,62
2019	13342	20997	0,64
2020	12114	19702	0,61
2021	11784	18752	0,63
Average	13469	21989	0,61

The provided table contains data on the harvested area, the number of tobacco producers, and the average area per producer in North Macedonia from 2015 to 2021. The analysis explores trends, implications, and possible reasons behind these figures.

Harvested area

Trend overview: The harvested area of tobacco fluctuates over the years, with the highest value of 14,505 hectares in 2018 and the lowest of 11,784 hectares in 2021.

After reaching a peak in 2018, there is a noticeable decline in the harvested area, particularly in the years 2019 to 2021.

Observations: The peak in 2018 suggests a period of favorable conditions for tobacco cultivation, possibly due to beneficial weather conditions, higher demand, or supportive policies.

The decline from 2019 onwards could indicate challenges such as unfavorable weather conditions, reduced market demand, or increased production costs. It may also reflect

shifts in agricultural priorities or changes in government policies affecting tobacco production.

Average harvested area: The average harvested area over the period is 13,469 hectares, which provides a benchmark for the typical scale of tobacco cultivation in North Macedonia.

Number of producers

Trend overview: The number of tobacco producers shows a consistent decline, from 24,234 in 2015 to 18,752 in 2021. This reduction indicates a decrease in the number of active tobacco farms over the years.

Observations: The decrease in the number of producers may be due to several factors, including economic pressures, market volatility, and increased costs of production. Smaller and less competitive producers might have exited the market, leading to a consolidation of production.

The decline could also reflect broader trends in the agricultural sector, such as shifts towards more profitable

crops or changes in farming practices that favor larger, more efficient operations.

Average number of producers: The average number of producers is 21,989, providing a reference for the typical number of active tobacco producers in North Macedonia over the observed period.

Average area per producer

Trend overview: The average area per producer shows a gradual increase, from 0.58 hectares in 2015 to 0.63 hectares in 2021.

This trend suggests that as the number of producers decreases, the remaining producers are managing larger areas of land.

Observations: The increase in average area per producer indicates a trend towards consolidation. Fewer producers are managing more land, which could be due to a variety of factors, including economies of scale, improved efficiency, and a shift towards larger, more commercial farming operations.

This consolidation may also reflect changes in market dynamics, where larger producers are better positioned to compete and achieve higher profitability, leading to a reduction in the number of smaller producers.

Average area per producer: The average area per producer over the period is 0.61 hectares. This figure highlights the typical scale of land managed by each tobacco producer and shows the growing concentration of production among fewer, larger farms.

Summary of Analysis

Harvested area: The fluctuations in harvested area, with a peak in 2018 and a subsequent decline, suggest varying

conditions and challenges faced by the tobacco sector in North Macedonia. The reduction in harvested area in recent years may indicate declining market conditions or increasing production challenges.

Number of producers: The consistent decline in the number of tobacco producers indicates a consolidation trend within the industry. Economic pressures, increased production costs, and shifts in market conditions are likely contributing factors.

Average area per producer: The increasing average area per producer reflects a consolidation of land among fewer producers. This trend suggests that remaining producers are managing larger operations, likely driven by the need for economies of scale and increased operational efficiency.

Overall, the data highlights a shift in the structure of tobacco production in North Macedonia, with fewer producers managing larger areas of land. This consolidation could have implications for the industry's economic dynamics, including changes in production efficiency, market competition, and policy needs. Understanding these trends is crucial for stakeholders aiming to address challenges and capitalize on opportunities in the tobacco sector.

The provided **Table 2** contains data on tobacco production and yield in North Macedonia from 2015 to 2021. The analysis focuses on production volumes, yield per hectare, and trends over the years to understand the dynamics of the tobacco sector.

Table 2: Production and yield of tobacco in the Republic of North Macedonia.

Year	Tobacco production and yield	
	Total, in tonnes	kg, per hectare
2015	24237	1503
2016	25443	1554
2017	22885	1434
2018	25547	1541
2019	26234	1573
2020	26112	1574
2021	24329	1574
Average	24970	1536

Total tobacco production

Trend overview: Tobacco production in North Macedonia shows some variability over the years, with the highest

production recorded in 2019 at 26,234 tonnes and the lowest in 2017 at 22,885 tonnes.

The production figures generally exhibit an upward trend from 2015 to 2019, followed by a slight decrease in 2020 and 2021.

Observations: The peak production in 2019 suggests favorable conditions for tobacco cultivation during that year, possibly due to improved farming practices, better weather conditions, or increased demand.

The subsequent decrease in production in 2020 and 2021 could be attributed to factors such as reduced planted area, less favorable weather conditions, or market challenges.

Average production: The average production over the period is 24,970 tonnes. This average reflects the typical scale of tobacco production in North Macedonia and provides a baseline for understanding annual fluctuations.

Yield per hectare

Trend overview: The yield per hectare, measured in kilograms, shows a generally increasing trend, from 1,503 kg/ha in 2015 to 1,574 kg/ha in 2021.

The highest yield of 1,574 kg/ha is recorded in both 2020 and 2021, indicating a peak in yield performance.

Observations: The increase in yield per hectare over the years suggests improvements in farming practices, such as better crop management, advancements in technology, or improved seed varieties.

The stability in yield in the latter years (2020 and 2021) despite a decrease in total production may indicate that while the area under cultivation decreased, the efficiency and effectiveness of production per unit area improved.

Average yield: The average yield over the period is 1,536 kg/ha. This figure represents the typical productivity of tobacco farming in North Macedonia and provides insight into the overall efficiency of tobacco cultivation.

Analysis of Production and Yield Trends

Production vs. yield trends

Production trends: The increase in total production from 2015 to 2019, followed by a decline, reflects fluctuations in overall output. This pattern may be influenced by changes in harvested area, market conditions, or external factors such as climatic conditions or economic policies.

Yield trends: The consistent improvement in yield per hectare suggests that, despite fluctuations in total production, the efficiency of tobacco cultivation has generally improved. This could be due to technological advancements, better agronomic practices, or more effective pest and disease management.

Impact of yield on production

The peak in yield in 2020 and 2021, coupled with a slight decrease in total production, indicates that the reduction in harvested area may have been offset by improved yield efficiency. This scenario underscores the importance of yield

improvements in maintaining or enhancing overall production levels.

Implications for tobacco sector

Economic and operational efficiency: The increase in yield per hectare is a positive indicator of the sector's efficiency and could help offset the effects of reduced production area. Improving yield is crucial for maintaining profitability and competitiveness in the tobacco industry.

Strategic focus: For future planning, focusing on strategies to sustain or further improve yield, alongside managing production volumes and areas, will be essential. This includes investing in modern agricultural practices, research on seed varieties, and technology adoption to enhance productivity.

Summary of Analysis

Total production: Tobacco production in North Macedonia exhibits variability, with an upward trend up to 2019 followed by a decrease in subsequent years. This reflects changing conditions and challenges in the sector.

Yield per hectare: Yield per hectare has shown a consistent increase, indicating improved efficiency in tobacco cultivation. The peak yield in recent years' highlights advancements in farming practices.

Overall trends: The increase in yield, despite fluctuations in total production, suggests that improvements in farming practices have played a crucial role in enhancing productivity. Addressing production challenges while continuing to improve yield efficiency will be key for the sector's future success.

This analysis provides a comprehensive view of tobacco production and yield trends in North Macedonia, offering insights into the sector's performance and areas for potential development.

CONCLUSION

The analysis of the economic performance of modern tobacco production in the Republic of North Macedonia reveals a sector undergoing significant transformation and adaptation. Over the observed period, the data shows both resilience and challenges in the face of evolving market dynamics, environmental factors, and policy shifts.

Tobacco remains a critical component of North Macedonia's agricultural economy, contributing significantly to employment and rural livelihoods. However, the trends in harvested area and the number of producers indicate a consolidation within the industry, with fewer producers managing larger areas. This shift suggests a move towards more efficient and possibly more profitable production practices, driven by the need for economies of scale and competitiveness in a global market.

The observed fluctuations in total production and harvested area, alongside the consistent improvement in yield per hectare, highlight the dual challenges and opportunities faced

by the sector. While the decrease in total production in recent years might point to market or environmental pressures, the increase in yield suggests that producers are adopting better farming techniques and technologies to enhance productivity.

Economic sustainability in tobacco production is increasingly tied to the ability to innovate and adapt. Producers who invest in modern agricultural practices, technology, and sustainable farming methods are likely to see better economic outcomes. This is crucial in a time when global tobacco demand faces uncertainties, and producers must navigate both local and international market pressures.

The future of tobacco production in North Macedonia will depend on continued efforts to improve economic performance through innovation, efficient resource management, and sustainability. Stakeholders, including policymakers, industry leaders, and farmers, must work collaboratively to address the challenges and leverage the opportunities within the sector. By focusing on enhancing productivity and ensuring sustainable practices, North Macedonia can strengthen its position in the global tobacco market while supporting the economic well-being of its rural communities.

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