

SUSTAINABLE PRODUCTION OF ORIENTAL TOBACCO IN THE REPUBLIC OF NORTH MACEDONIA

Jane ALEKSOSKI^{1*}

*¹Department of Genetics, Selection and Seed Control, Scientific Tobacco Institute – Prilep, University St. " Kliment Ohridski - Bitola
^{*}Corresponding author e-mail: yaleksoski@gmail.com*

ABSTRACT

Sustainable tobacco production is defined as the efficient production of quality tobacco raw material, under conditions that limit the negative impact on the environment, in a way that improves the socio-economic conditions of people and their communities in the areas of tobacco production. This paper aimed to investigate the sustainability of oriental tobacco production in the Republic of North Macedonia, where the best fine-leaf aromatic oriental tobaccos are traditionally grown. Poor soils and a dry climate are most suitable for its cultivation. In addition, there are several advantages from a social and economic point of view. The production of oriental tobacco, compared to other types, has significantly less harmful impact on the environment, uses less water for irrigation, less amount of synthetic fertilizers and pesticides, as well as less fossil fuel, and occupies significantly smaller areas. Sun-cured types of tobacco do not require any fossil fuels for curing compared to the flue-cured types of tobacco grown worldwide. Scientific Tobacco Institute - Prilep is engaged in creating sustainable production strategies for soil and water conservation, adopting precision agricultural measures and low input strategies to help farmers cope with the global crisis and climate change. Its research activity is also focused on the improvement of the existing and the creation of new, sustainable, and draught-resistant varieties. In this paper, we were focused on the economic viability of oriental tobacco production and the adoption of new methods to achieve good agricultural practices and better environmental management.

Keywords: Sustainable production, oriental tobacco, strategies, environmental, agricultural.

INTRODUCTION

Tobacco is grown on over 3 million hectares of land each year worldwide. Broadleaf, oriental, and semi-oriental types are grown. The production of broadleaf varieties of tobacco degrades the soil the most, threatens biodiversity and the use of pesticides and fertilizers exposes the farm workers to hazardous chemicals [4].

Up to 90% of tobacco farming is in low- to middle-income countries, with the top being China, Brazil and India [2]. Tobacco cultivation has been linked to soil degradation as well as deforestation [1]. Broadleaf tobacco varieties absorb more nitrogen, phosphorus, and potassium than other major food and cash crops, leading to poor soil fertility and pesticide residues in the soil and the underground water table. Research on the decline in soil quality in Brazil concluded that long-term tobacco cultivation in Brazil has led to increased soil erosion and soil degradation [8]. Flue-cured tobacco results in global deforestation of farmland and wood burning. By the mid-1990s, more than half of the 120 tobacco-growing low- and middle-income countries were losing a combined 211 000 hectares to deforestation annually. An estimated 11.4 million metric tons of wood are burned to cure tobacco every year [2].

Oriental Tobacco production in the Republic of North Macedonia has changed or modernized very little over the years. Individual producers still rely on traditional methods of production to maintain high quality, specifically for oriental tobacco. Excessive use of synthetic fertilizers, especially nitrogen fertilizers, significantly decreases its quality. Its high content of tar and nicotine provides natural protection against many pests and diseases therefore the use of pesticides in many cases is minimal.

The Scientific Tobacco Institute in Prilep will conduct a study in 2022-23 where the total cost of production for 1 ha of oriental tobacco is shown. Two variants were studied with different doses of fertilization with NPK (8:22:20), the first variant with 200 kg/ha and 13 kg of ammonium nitrate, and the second with 250 kg/ha and 22 kg of ammonium nitrate. The project is expected to release data that will guide lower costs and optimal tobacco production. The results of the study show that oriental tobacco absorbs much less nitrogen, phosphorus, and potassium than other major food and industrial crops, and certainly less than flue-cured tobacco [7].

When it comes to pesticide use it is well known that sun-cured tobacco uses approximately 200 – 400 l/ha of field sprays for leaf diseases and pests compared to flue-cured tobacco that has a significantly larger leaf mass and can use up to 1t/ha of tank mix. According to Gveroska et al. [3], the use of biological preparations in tobacco production means a contribution to sustainable agriculture.

The usage of water for irrigation varies for both sun and flue-cured tobacco depending on the climatological characteristic of a specific area, the rainfall, and the variety grown. In the area of Prilep – Republic of North Macedonia it is well known that flue-cured tobacco will take more than double the amount of water for irrigation compared to oriental tobacco orientals are irrigated with half the amount of water compared to broadleaf tobaccos. The use of the "drop by drop" system (Scientific Institute for Tobacco - Prilep) also contributes to the reduction of costs in tobacco production. Today we are facing a big problem, which is drought as a result of global warming. Excessive irrigation of oriental tobacco increases the yield but reduces the quality of the raw material. That is why varieties are marketed that are more resistant to drought and have a good yield. Korubin–Aleksoska et al. [5], in their two-year research on nine oriental varieties at the Scientific Institute for Tobacco - Prilep, found the best results for drought tolerance in Prilep P-84 and Pobeda - 2.

Sideration (application of green manure), as well as crop rotation, mean another possibility for sustainable production of oriental tobaccos in these areas [6].

The aim of this paper is to highlight the possibilities that will make tobacco production sustainable in the Republic of North Macedonia.

Using sustainable farming methods for the production of oriental tobacco

Sustainable tobacco production is defined as the efficient production of quality tobacco in conditions that limit as much as possible the impact on the natural environment and that improve the socioeconomic conditions of the people and communities involved in its production. For this purpose, there are Sustainable Tobacco Programmes (STP), which define the guiding principles and criteria to be met by tobacco companies and growers. These guiding principles and criteria

are organized around four focus areas: Crop, Environment, People, and Facilities. Governance is the foundation of these areas and incorporates the management processes that must be in place to successfully implement the Sustainable Tobacco Programme.

In this paper, we will present the most important steps for implementing sustainable tobacco production.

Provision of certified seed material:

Tobacco producers in the Republic of North Macedonia usually get their seed material from tobacco-buying companies that supply their cooperators with certified seed material and basic agricultural materials. The choice of variety and type of tobacco that manufacturers receive from their buyers usually depends on the climate of production as well as the quality norms of the buyer. The authorized producer of certified seed material for tobacco in our country is the Scientific Institute for Tobacco in Prilep. This facility has a variety of tobacco types that enable production in various soil and climate conditions. Following the norms of good agricultural practice, in tobacco, as in other crops, a variety or hybrid should possess:

- Good resistance to diseases and pests.
- High yields.
- Good quality.
- Drought resistance.

It is recommended that the producer keep proper documentation on the plots on which tobacco is produced, on the varieties planted and on their yield, and quality.

Integrated pest management (IPM):

Integrated pest management (IPM) represents a coordinated approach to dealing with diseases, pests, and weeds, where several methods (agronomic, biological, chemical) are used, to prevent damage to the culture, and thus to prevent economic losses. Excessive use of chemical agents represents an environmental risk and must not exceed the economic profitability limit faced by the producer. Pesticides should be used expertly in combination with other preventive measures.

Basic norms of IPM:

- Selection of varieties resistant to economically important diseases and pests in tobacco.
- Mandatory application of crop rotation (it is possible to consult an expert on the sequence of crops).
- Planting of healthy and uniform plants (properly produced seedlings, without signs of diseases and pests, are a very significant factor towards further production and protection).
- Seedling production and planting of seedlings in the field should begin in the optimal terms prescribed depending on the region of production.
- Destruction of unused seedlings (timely plowing of the beds).
- Cleaning and maintenance of agricultural machinery and equipment in order to avoid any kind of contamination.
- Provision of well-drained plots in order to prevent them from flooding (cleaning of canals, other agro technical measures).

- Use of alternative protection measures in order to reduce the use of chemical preparations (promotion of biodiversity and beneficial insects - predators).
- Correct and timely identification and knowledge of disease, pest and weed cycles.
- Proper preventive treatment.
- Treatment against diseases, pests and weeds in the most sensitive period of their life cycle.
- Precise use of pesticides according to the manufacturer's instructions (treatment at the correct time of day, complete and even coverage, use of prescribed doses, etc.).
- Use of selective pesticides allowed in the EU (safe for beneficial insects, preparations with minimal eco-toxicity).
- Appropriate rotation of pesticides i.e. changing them in order to prevent the development of resistance in pests, pathogens and weeds.
- Correct assessment of the economic justification of the treatment against the possible damage.
- It is recommended to keep proper documentation for the plot planted with tobacco, for the occurrence of diseases, pests, and weeds, for their percentage representation, the degree of damage as well as for the period when they appeared. It is also desirable to document each application (name of the product, dosage, and time of treatment).

Proper fertilization of oriental tobacco:

In the conditions of an economic crisis, when the prices of mineral fertilizers record a constant increase, their tobacco application should be carried out within the prescribed norms, ensuring stable yields and minimal environmental damage. Fertilization in tobacco depends on several factors, such as: soil type, types and varieties of tobacco, pre-culture, expected yield, etc. To make a correct tobacco feeding program, the first step is of course soil analysis. Such analyses allow insight into several parameters that are of great importance in the formation of the crop fertilization program. The excessive use of mineral fertilizers contributes to the accumulation of certain elements in the soil, which can later pass into the underground water, canals, and rivers, contributing to their pollution. The long-term use of mineral fertilizers is also associated with the destruction of the soil structure and its fertility.

For optimal results and economic sustainability in tobacco, as in other crops, alternative methods of fertilization have been increasingly used lately, such as:

- Green manure
- Use of animal manure.
- Foliar nutrition.
- Using ash, limestone and other minerals.
- Using organic fertilizers obtained from seaweed, animal bones (bone meal), plant extracts, etc.
- Correct crop rotation using crops that fix nitrogen in the soil.
- Installing a "drop by drop" system for optimal irrigation and saving fertilizers.

When using these methods for tobacco and other crops, it is extremely important to keep proper documentation about the used fertilizers and the history of the plot. This allows us to successfully plan future production and fertilization programs.

Soil Management:

We must see the soil as a living, dynamic and very delicate system. When choosing plots for tobacco production, we need to consider several criteria, such as:

Soil type.

The slope of the plot.

Drainage (are there conditions for retaining water on the plot).

History of the plot i.e. crop rotation.

Soil analysis, etc.

Conventional production of tobacco and other crops in most cases implies multi-year monocultures, where every year a large part of the organic matter in the plot is removed as an active yield or final product. In this way, the use of synthetic fertilizers contributes to the destruction of the soil structure and the reduction of organic matter. The methods of excessive soil cultivation with their advantages also have many negative sides, contributing to soil erosion, loss of structure and organic matter, as well as disruption of the beneficial soil system of beneficial bacteria, nematodes and other microorganisms. In order to preserve the soil and its structure, minimal tillage methods are increasingly being used in the world, and plowing is increasingly rejected as economically unjustified and harmful to the soil system.

Water resources management:

In conditions of global warming in agricultural production, every drop of water is precious. Proper management of water resources is of great importance for the production of tobacco in the Republic of North Macedonia. The construction of new accumulations as well as the maintenance of old ones plays a major role in plant production. For a rational and sustainable use of a country's water resources, producers should adhere to certain rules and standards of good agricultural practice:

Avoid preparing or applying chemicals near rivers, streams, canals and lakes.

To prevent leakage of synthetic fertilizers into the water network.

Any pollution of underground and surface water is strictly prohibited in every country.

Rational use or saving of water in agricultural production by applying "drop by drop" systems and setting correct irrigation norms.

Rational use of underground water.

Raising of protective belts with vegetation in order to reduce the leakage of water from agricultural lands into the water network.

Rational use of synthetic fertilizers in order to prevent their contact with groundwater.

Management of chemicals in tobacco production:

The term chemicals in modern tobacco production means all pesticides, inorganic fertilizers and other means of production of a chemical nature. Following the trend of good agricultural practice, the manufacturer strives for a reduced use of these resources, in order to reduce their harmful impact on the environment, at the same time reducing production costs. The responsible application of these preparations implies application by trained personnel, their correct application and protection at work, use of protective equipment, their proper storage and proper handling of the empty packaging.

Use of chemical preparations:

- We always use substances that are allowed in the EU, taking into account the safety of the worker who handles them and the protection of the environment
- It is extremely important to adhere to the instructions for the preparation being used: application of recommended doses, safe handling, correct mixing of preparations, use of protective equipment, safe application, etc.
- After the application of the pesticides, the plot should be marked in order to avoid contamination of the workers.
- We must respect the intervals of their application, taking into account the maximum number of treatments with one preparation in the current season.
- Eating, drinking and smoking are prohibited when handling chemicals and in the rooms where they are stored.
- The worker must have access to sanitary facilities where he/she can perform proper cleaning and decontamination of the equipment.

Storage of chemical preparations and mineral fertilizers:

- Chemical preparations and mineral fertilizers are kept in special rooms for that purpose.
- Such rooms should be away from flammable materials, water supply areas and buildings where people stay.
- Storage areas should be secured against the entry of unqualified personnel, visitors, children and wild animals.
- In such facilities, it is extremely important that the temperature is within the limits of the prescribed storage temperature.
- Chemical preparations must be stored in their original packaging.
- Once opened preparations must be well closed until the next use.
- You should always take care of the expiration date of each product.
- The facility should be marked with signs for prohibited entry, prohibited smoking, prohibited consumption of food, drinks, etc.

The packaging of used chemical preparations and mineral fertilizers must be handed over to a service in charge of its recycling. It is strictly forbidden to burn the empty packaging or mix it with ordinary waste.

Use of labor in tobacco production:

Over the years, tobacco production has been modernized and many operations that were performed manually, we can say with certainty that they have been replaced by the use of agricultural machinery. Despite this, labor still plays one of the main roles in tobacco production. Too many operations are still performed manually, which implies the use of large numbers of seasonal workers. Laws and standards for the use of hired labor in each country are different and change frequently. Of course, the most important thing is to respect the laws and not to violate the rights of workers.

- Work in tobacco production must be voluntary.
- Involvement of children in the production process is not recommended.
- The minimum wage at the state level should be respected.
- The basic conditions for hired workers should be provided (sanitaria, clean drinking water, transportation, breaks in the hottest parts of the day, meals, etc.).

- Ensuring a safe working environment where the risk of injuries and health risks is reduced to a minimum.
- Provision of protective work equipment (gloves, masks, protective suits) for workers.
- Workers who operate agricultural machinery should have appropriate professional training.

CONCLUSIONS

- Sustainable tobacco production in the modern world requires integrated control of energy consumption, water, and raw materials, as well as prevention of environmental pollution.
- Oriental tobacco, as shown in this paper, requires considerably less input compared to the flue-cured tobacco grown worldwide, therefore posing a significantly lower environmental impact.
- Measuring the social, economic and environmental impact of tobacco farming activities, and conducting precision and evidence-based research to ascertain its footprint, is critical to ensure the long-term sustainability of the activity in the region.
- Traditional farming methods compared with new technologies, used in modern tobacco production, show promising results in preserving valuable environmental resources as well as providing financial benefits to the developing rural communities in the Republic of North Macedonia.

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