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Sustainable Agriculture in The Tobacco Industry: Future Trends and Challenges

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ABSTRACT

Introduction/Main Objectives: Sustainable agricultural practices are crucial for tobacco production because they reduce environmental damage, support moral farming, and guarantee financial stability. **Background Problems:** In every stage of the tobacco life cycle from cultivation, production, distribution, consumption to post-consumption, tobacco poisons the environment and causes extensive harm. **Novelty:** Research about the tobacco industry's future trends and challenges in sustainability is still rare. **Research Methods:** The research looks at future trends and challenges in sustainable tobacco practices. The literature review was done in order to accomplish the research. **Finding/Results:** In order to overcome these obstacles and create a more sustainable model for tobacco production, it is imperative that innovative and sustainable farming methods be implemented, along with fair labor efforts and farmer support during the transition. **Conclusion:** A sustainable future for agriculture that benefits present and future generations requires striking a balance between economic interests and environmental, social, and cultural factors, as well as implementing regenerative agriculture.

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1. INTRODUCTION

The conversation about sustainability in agriculture has spread to unanticipated crops, tobacco is one such prominent candidate. In a sector frequently linked to environmental issues, sustainable tobacco production signifies a paradigm shift. This dynamic strategy aims to strike a balance between the financial needs of tobacco growers and the critical need to protect ecosystems and advance moral behavior.

The agricultural environment is changing, which makes it necessary to look for sustainable substitutes for historically controversial commodities. In every stage of the tobacco life cycle from cultivation, production, distribution, consumption to post-consumption, tobacco poisons the environment and causes extensive harm. In this global dialogue, sustainable tobacco farming is becoming increasingly important. This investigation explores the tenets, methods, and consequences of sustainable tobacco farming, providing insight into the sector's transition to a future in which it is more socially and environmentally responsible. The efficient production of high-quality tobacco in an environmentally conscious manner that enhances

the socioeconomic standing of individuals and their communities is known as sustainable tobacco production. This effort was created in partnership with other manufacturers with the goal of bringing together industry best practices and promoting ongoing development.

The production, distribution, and farming of tobacco products define the global tobacco business, which is a sizable economic sector. It is dominated by a small number of powerful global companies and is challenged by changing customer tastes, rising health consciousness, and laws intended to reduce tobacco use. The United Nations report, titled "Our Common Future," is frequently referred to as the Brundtland report (United Nation, 1987), after Gro Harlem Brundtland, the chair of the World Commission on Environment and Development. The paper discusses the necessity for political transformation in order to achieve sustainable development and defines it. The report of Brundtland stated "Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The three pillars are as follows:

a. Environment: preserve nature
b. Economy: society shouldn't rely on its limited resources.
c. Social justice, gender equality, and generational issues

Tobacco serves as an excellent illustration of the interdependence of the various objectives and the requirement for a comprehensive strategy to attain them. The development of sustainable tobacco agriculture places an emphasis on growth that minimizes negative effects while promoting favorable environmental, economic, and social results. The current situation has resulted in a worldwide crisis involving food and energy insecurity, biodiversity loss, and climate change. To maintain healthy people and a healthy world, however, we must go beyond sustainability and strive for regenerative development, which is centered on refilling and revitalizing living systems. In doing so, long-term sustainability will be given priority, and pressing global issues will be addressed. The state of environmental destruction we are at now makes it insufficient to just maintain what we already have. The natural system that sustains all life on Earth has to be replenished.

2. LITERATURE REVIEW

The series of steps necessary to turn a raw material into finished items that are sold to customers is known as the supply chain. According to the research of the University of Bath (Bloomfield MJ, 2024), there are six main procedures in the supply chain:

a. Tobacco is grown in agriculture
b. Tobacco is processed in primary processing (tobacco leaf preparation)
c. Tobacco products are processed in secondary processing (making tobacco products)
d. Tobacco is moved via logistics
e. Marketing and retail (tobacco sales)
f. Tobacco use and disposal

Three more procedures are as follows:

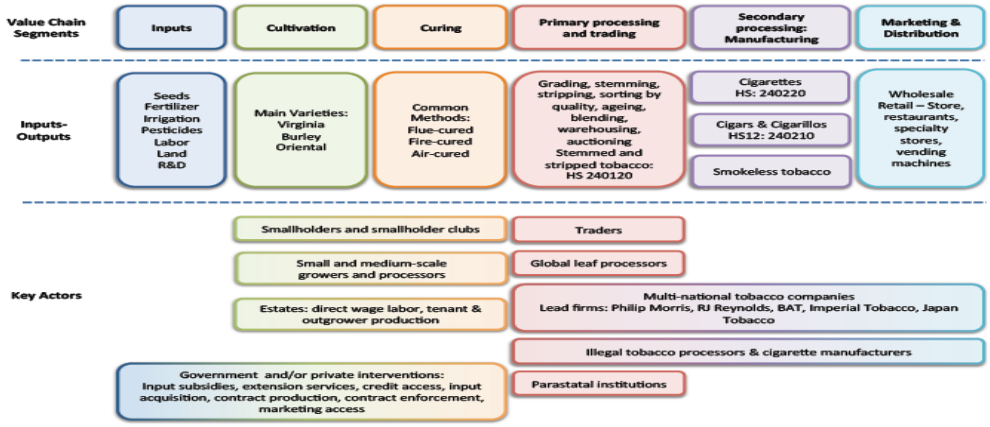
a. Research and development (finding new methods to make money off of tobacco)
b. Accessories (improving the experience of using tobacco)
c. Business and financial services

These procedures encompass numerous industries, such as agriculture, manufacturing, distribution, and retail. In addition, additional businesses such as machinery, chemicals, buildings, and cigarette components (mostly paper and filters) are needed to support the tobacco supply chain.

The global supply chain for tobacco consists of six stages (Byrnes & Hartanto, 2024), three different tobacco post-harvest processes, which frequently take place in various places and with various institutional setups:

a. Curing, which consists of drying green tobacco leaf and then performing two processing steps on the farm. It is virtually finished.
b. Stemming, stripping and blending tobacco.
c. Transforming raw tobacco into a finished product, such as cigarettes.

Figure 1. Tobacco Global Supply Chain



Source: (Annelies, 2014)

Figure 1 illustrates the steps involved in the production of tobacco, along with the input-output structure, lead actor, and activities for each level of the chain.

Stage 1 : Input—land, labor, and physical requirements for competitive production.

Stage 2 : Cultivation

Stage 3 : Curing

Stage 4 : Primary processing and trading—stemming and stripping of tobacco

Stage 5 : Secondary processing—manufacturing

Stage 6 : Marketing and distribution—final product to consumers. The tobacco industry has become increasingly consolidated over time.

Figure 2. Tobacco Domestic Supply Chain

Source: (Indonesia: Child Tobacco Workers Suffer as Firms Profit, 2016)

In Figure 2, a limited number of leaf buyers and tobacco businesses hold significant market power over the supply chain, while small farmers typically have very little negotiating strength. While there are still many various ways that tobacco is produced, outgrow or contract-based production methods are now the most common ways for leaf buyers to establish relationships with other firms in order to guarantee supply. In accordance with these methods, the buyer may give the producer inputs and financing either directly or through "tobacco clubs," which are collective groupings of ten to thirty growers. In exchange, the tobacco growers consent to furnish the designated quantity of raw tobacco when it is grown and take on the risks associated with cultivation.

Stage 1: Input: Physical, labor, and land needs for competitive output. Compared to other crops, tobacco requires a lot more effort in the agricultural process because it is difficult to mechanize. Because of this, tobacco cultivation is a significant employer. The following are activities related to input:

a. Providing farmers with a sufficient supply of seeds: This involves working with tobacco corporations, leaf merchants, and major producers.
b. Supplying fertilizers, insecticides, and herbicides for use with tobacco crops is known as agrochemical manufacture and blending (agrochemical supply firms).
c. Capital from banks and finance: funds used by tobacco farmers to purchase seeds, agrochemicals, and other inputs (leaf merchants, banks, and governments).
d. Research & development: Create innovative production methods, machinery, and seed varieties (such as pest and drought resistance) in collaboration with tobacco, public research groups, and biotechnology companies

Stage 2: Cultivation. Certain biophysical parameters are necessary for the cultivation process; soil quality, climate, and availability of irrigation systems all have an impact on production and quality. Cultivation-related activities include:

a. Agricultural extension: Agronomists visit farmers on a weekly, biweekly, or monthly basis with the goal of educating and training them in tobacco production (tobacco corporations, leaf merchants, industry groups, producer collectives, and governments).
b. Spraying: Agrochemical spraying (producers, third-party corporations for smallholder production) is done on tobacco crops during cultivation.
c. Hail insurance: insurance firms, cigarette corporations, and leaf sellers) to shield crops from unforeseen catastrophes like wind and hail.
d. Farm equipment and infrastructure maintenance: maintaining agricultural machinery, including irrigation systems, for the purpose of growing and harvesting tobacco (local producers, technicians, and mechanics).
e. Market information provision: Establish channels and spaces (mobile communications companies, traders, governments, industry groups, and producer collectives) enablfarmers to communicate and acquire market information.

Stage 3: Curing. Following harvest, leaves are graded into homogeneous lots, aged, or fermented after being dried (cured) to stabilize them. There are differences in the curing process of tobacco depending on whether it is air-cured or sun-cured. Fire-cured and flue-cured tobacco require an energy source (typically heat or coal) for heat. The following are activities related to curing:

a. Transportation: Move from fields to warehouses and curing areas (manufacturers, MNC affiliates, and leaf dealers).
b. Firewood or coal provision: Fuel harvesting, mining, processing, and distribution (producers—firewood, or third-party providers) for curing purposes.
c. Equipment and infrastructure maintenance: maintaining the infrastructure and tools (builders, manufacturers, or mechanics) needed for the curing of tobacco, such as boilers, sheds, and flues.
d. Warehousing: Storage for raw, cured tobacco (dealers, manufacturers, or representatives).

After curing, the tobacco is sorted, packaged into uniform bales, cut into strips (for some varieties), and exported to factories that will make cigarettes, cigars, and other products out of it (Alliance One International, 2023). The by-product of the stemming, curing, and stripping processes, or tobacco trash, is exported in part as well.

Stage 4: Primary processing and trading—Stemming and stripping of tobacco (Primary Processing). Tobacco leaves are stemmed and stripped in order to maintain a controlled moisture level and avoid deterioration during storage. Since cured but unprocessed tobacco is a semi-perishable commodity, the initial processing needs to happen somewhat quickly. The majority of processing facilities are found in producing nations, where they are run by leaf merchants and subject to buyer audits. At this point, tobacco is grade-reclassified and blended in accordance with customer quality requirements.

After that, the tobacco is sieved to get rid of trash and threshed to remove the stem from the lamina. After that, tobacco is re-dried to increase its shelf life in storage, even though most tobacco is consumed within two to three years. Tobacco that has been stored is packed for transport in cartons, cases, and bales. Until the purchasers (tobacco MNCs) select the dates of shipment, the leaf merchants normally keep the inventory. After that, tobacco is transported to the location of manufacture, where the finished tobacco products are created. Alliance One International and Universal Corporation, two multinational leaf merchant companies, compete fiercely for a sizable portion of the primary processing stage market share (Universal Corporation, 2023). Activities associated with primary processing are:

a. Auction: Services for connecting tobacco companies and leaf merchants with farmers that don't use direct, contract-based procurement (private auction firms or parastatal organizations).
b. Transportation: Transport to and from warehouses to export destinations (tobacco MNCs, producers, agents, and transportation companies), as well as stemming and stripping locations.
c. Warehousing: Storage for primary processed tobacco (manufacturers, distributors, agents, and multinational tobacco companies).
d. Import/export: Governments and private contractors handling customs, tariffs, taxes, etc.

Stage 5: Secondary processing—Manufacturing.

The process of turning raw tobacco into finished tobacco products including cigarettes, cigars, cigarillos, and others is known as secondary processing. Internal manufacturing is the norm for tobacco firms. Contrary to the value chain's production stage, the manufacturing of cigarettes is highly automated. It involves packing cigarettes into cartons with ten packs each, rolling and cutting rods into individual cigarettes, and inserting filters. In secondary processing, the biggest companies include (Japan Tobacco, Inc., 2023):

a. Pillip Morris International (PMI) has 48 plants in 32 countries.
b. British American Tobacco (BAT) has 44 plants in 42 countries.
c. Japan Tobacco International (JTI) has 25 plants worldwide.
d. Imperial Tobacco has 51 plants worldwide.

The following are some actions related to secondary processing:

a. Transportation: Transport from manufacturing facilities to export destinations or retail stores, as well as from import locations to manufacturing facilities (logistics businesses, tobacco MNCs, leaf merchants, and agents).
b. Warehousing: Finished tobacco product storage (tobacco MNCs).
c. Paper provision: Rolling paper for cigarettes (suppliers of paper and tobacco MNCs).
d. Manufacturing equipment provision: Provide equipment (equipment providers) for the production of cigarettes and other tobacco products.Manufacturing

equipment maintenance: Maintain production lines and tobacco manufacturing equipment (MNCs and mechanics).

b. Financial consulting (for leaf merchants and global buyers): Strategic guidance for tobacco multinational corporations and management consulting firms on preserving and growing shareholder value.
c. Financial and banking (for leaf merchants and global buyers): Accounting, asset management, and investment for multinational tobacco corporations and leaf merchants (investment banks, hedge funds, or tobacco MNCs).
d. Legal: Legal counsel about R&D and tobacco production (from law firms and tobacco multinational corporations).

Stage 6: Marketing and distribution—Final product to consumers. The big international tobacco businesses also handle the finished product's branding and marketing. The following are some of the marketing and distribution stage activities:

1. Transportation: Shipment to distribution centers and retail stores (logistics companies and multinational tobacco companies).
2. Advertising: Marketing and product promotion within the limitations of national tobacco marketing regulations in certain nations (advertising agency and tobacco multinational corporations).
3. Logistics: product distribution to retail locations and warehousing logistics (logistics companies and tobacco MNCs).

The premium, economy, and low-value cigarette brands are separated into distinct price segments according to the willingness of the consumer to pay.

Tobacco has a multi-stage input-output structure, with production and processing taking place in geographically separated places. The disparity in the production requirements of each stage accounts for the geographic separation of the stages; some demand a lot of manpower and land (cultivation), while others are capital-intensive, quality-sensitive, and mechanized (cigarette manufacturing). In this structure, MNCs usually operate in the highest value portions of the chain (marketing and distribution), while small producers are positioned in a highly competitive low-value segment of the global value chain for tobacco. This arrangement also highlights the problem of transfer pricing across tobacco industry divisions or multinational corporations (MNCs) (Hartanto, 2024).

According to Cooperation Centre for Scientific Research Relative to Tobacco in Coresta Technical Guide No 17 about Sustainability in Leaf Tobacco Production through the responsible management of tobacco growing (Coresta, 2024)**, t**he objectives of the guideline are to identify key challenges for sustainability in tobacco leaf production, to review, update and complement Coresta Guide No. 3, Good Agricultural Practices (GAP) Guidelines

(Coresta, Coresta Guide No 3: Good Agricultural Practice (GAP) Guidelines, 2021), considering sustainability principles and/or best Practice, and to identify tools to support the achievement of sustainability in tobacco production.

According to Coresta Technical Guide No 17, sustainability in leaf tobacco production focus on four key areas including governance, agronomy, curing and livelihoods. Key challenges and opportunities in order to provide tobacco organizations with a set of tools and advice on how to address long-term sustainability in tobacco production are:

A. Governance

These recommendations are intended to facilitate a shared, non-competitive approach to the four sustainability dimensions of farm performance, reporting benchmarks, stakeholder involvement, and governance structure.

B. Agronomy

The concepts and sustainable practices related to biodiversity, integrated pest and disease control, plant nutrition, soil health and conservation, and water resource management are included in these guidelines.

C. Curing

The type and source of building materials, fuel sources, fuel efficiency, curing process management, and safe handling are only a few of the topics covered in these rules pertaining to leaf curing.

D. Livelihoods

The practices covered by these standards include capacity building, land tenure, fair compensation for growers and workers, connections between farmers and purchasers, health and safety, and financing availability.

Sustainable tobacco production faces several challenges that demand strategic solutions to address environmental, social, and economic concerns. One major challenge revolves around the environmental impact of traditional tobacco farming practices, including deforestation, heavy pesticide use, and soil degradation. Balancing the demand for tobacco with preserving biodiversity and ecosystem health poses a significant hurdle.

Social challenges involve issues such as child labor, as the tobacco industry has historically faced criticism for exploitative practices in some regions. Ensuring fair labor practices, workers' rights, and community development become critical aspects of sustainable tobacco production. Economically, farmers may face challenges in transitioning from conventional to sustainable practices, which often require upfront investments. Securing access to sustainable farming inputs, adopting eco-friendly technologies, and coping with potential yield variations during the transition can be hurdles.

Adopting innovative and sustainable agricultural practices, engaging in fair labor initiatives, and providing support for farmers during the transition are essential steps to overcome these challenges and establish a more sustainable tobacco production model. Emerging trends in sustainable tobacco cultivation include a focus on agroecological practices, reducing chemical inputs, and promoting biodiversity. Sustainable certifications, like the Sustainable Tobacco Program, emphasize

environmental conservation, water management, and fair labor standards.

3. METHOD, DATA, AND ANALYSIS

Sustainable agricultural practices are crucial for tobacco production because they reduce environmental damage, support moral farming, and guarantee financial stability. The entire life cycle of tobacco use—cultivation, production, distribution, use, and post-consumption—causes serious harm to the environment. The study examines environmentally friendly tobacco methods. In order to identify potential future trends and obstacles in sustainable tobacco practices, a review of the literature was conducted. This study employed a qualitative method called literature review. A literature review involved researching, reading, analyzing, evaluating, and summarizing scholarly literature, typically journals and articles about sustainable agriculture in the tobacco industry. After researching and collecting journals and articles, the reading was followed by a rigorous analysis and evaluation. The review synthesized and summarized the findings, offering a critical perspective on the existing literature about future trends and challenges in tobacco industry which lead to good agricultural practices.

The goal of good agricultural practices is to guarantee the economically and environmentally sound production of useable tobacco. To overcome these obstacles and create a more sustainable tobacco production model, it is imperative to implement creative and sustainable farming practices, participate in fair labor initiatives, and offer support to farmers during the transition. One method to totally change the land is through regenerative agriculture, which also replenishes essential nutrients and restores biodiversity. To ensure that agriculture has a sustainable future that benefits present and future generations, it is imperative to strike a balance between economic interests and environmental, social, and cultural factors, as well as implementing regenerative agriculture.

4. RESULT AND DISCUSSION

It's true that the tobacco industry isn't just 'Big Cigarette' any more, although the money trail almost always leads back to the same companies that have done 'corporate makeovers' so many times. "Greenwashing" refers to the practice used by controversial industries to market their goods and/or image as environmentally friendly in an effort to increase product sales and divert public attention from their own environmentally damaging practices.2 Reporting environmental impact and funding environmental corporate social responsibility projects and organisations, serves to "greenwash" tobacco companies, and detract from the harms the industry inflicts on the environment and environmental health (Alebshehy, 2022).

The tobacco industry is embracing environmental, social and governance (ESG) factors when making business decisions to attract investors and consumers, comply with legislation and gain competitive advantage. The development of environment and social interest initiatives is expected to continue, encouraged by increasing pressure from key stakeholders. With tobacco users showing a commitment to environmental initiatives, but also being increasingly price sensitive, tobacco players are struggling to pass the

cost of compliance with sustainability measures on to consumers. As the industry-funded advocates for 'creative destruction' suggest, the answer to our global health crisis really is a sustainable tobacco industry (Malone, 2023).

The importance of sustainable practices in tobacco cultivation lies in mitigating environmental impact, promoting ethical farming, and ensuring economic viability. Sustainable approaches, such as agroforestry and organic farming, reduce soil degradation and chemical usage, safeguarding ecosystems.

4.1.Good Agriculture Practice

Good Agricultural Practices (GAPs) are defined as agricultural practices that yield a quality crop while safeguarding, maintaining, or improving the environment with regard to soil, water, air, animal, and plant life. GAPs are intended to ensure the sustainable, economically viable production of usable tobacco (Coresta, Coresta Guide No 3: Good Agricultural Practice (GAP) Guidelines, 2021). Nowadays, there is a growing emphasis on more environmentally friendly agricultural production techniques as well as the effects that farming practices have on the environment. It is necessary to implement systems that are more considerate of genetic diversity, the environment, wildlife and its habitats, and, in certain situations, the social structures of rural communities. Moreover, today's global consumers are more discerning and demanding than ever before, wanting to know what exactly and how their agriculturally derived goods are made.

The same holds true for the tobacco business and all of its suppliers, including growers, extension agents, leaf buyers, manufacturers, and other related agricultural-based businesses that contribute significantly to the growth of our sector. In order to guarantee that tobacco is produced responsibly, preserving the environment, natural resources, and the livelihood of those who grow the crop, as well as providing a raw material of the appropriate quality at a competitive price, progress has already been made in a number of areas. GAP must simultaneously provide a safe working environment for people directly involved in the crop's production as well as economic viability for the farmer. This is the idea behind responsible crop production, or good agricultural practice, or GAP. There is no single GAP template that works for all farm circumstances because tobacco is grown in a wide range of geographical locations with diverse agricultural systems and varying degrees of sophistication. When producing tobacco, there are some guiding principles that producers should take into account. Within the agriculture business, there are differing definitions of GAP, and among members of the tobacco industry, there are differences in the programs that are currently in place as well as in the ways that adherence and progress are measured. There are several similarities as well as specializations.

4.2. Tobacco Farming's Effect on the Environment

The land and resources needed to plant tobacco must be obtained through the exploitation of scarce land and forest clearing (Hartanto, 2017). After growing on small plots of land in countries where food is scarce, the majority of this tobacco is shipped. Much wood is also utilized in the curing

process of tobacco leaves. Smoking wood or coal to heat the air is a rapid way to cure tobacco leaves called "flu" curing. A 50 million tree cut-down year estimate results from this. Perhaps growers cannot afford to adopt the more affordable methods of curing tobacco leaves.

Tobacco producers are susceptible to green tobacco sickness (GTS), in addition to the health risks connected to pesticide use. Nicotine is absorbed via the skin when someone comes into touch with wet tobacco leaves, leading to the development of Generalized Toxin Syndrome (GTS). Symptoms include headaches, nausea, vomiting, cramps, weakness, and lightheadedness. Seasonally, the illness afflicted 8% to 89% of tobacco producers. In addition to being smaller in stature, children whose labor is heavily employed in tobacco farming are more susceptible to 14 GTS because they do not yet possess the requisite nicotine resistance to protect them from these harmful effects.

According to the World Health Organization, an employee who grows, harvests, and seeds tobacco may inhale as much nicotine as fifty cigarettes every day (World Health Organization, 2023). Commonly known as "green tobacco sickness," nicotine poisoning can occur from contact with damp tobacco leaves when the plant is being produced. Growers of tobacco are exposed to risks from the use of pesticides and other agrochemicals. Investigations revealed that 66% of tobacco workers had signs of pesticide poisoning.

4.3. Sustainable Agricultural Techniques

Some sustainable agricultural techniques that support Good Agricultural Practices (GAPs) are (Coresta, Coresta Technical Guide No 17: Sustainability in Leaf Tobacco Production, 2024):

a. Organic farming.
   Sustainable and ecologically friendly agricultural techniques are given priority in organic farming systems. These include encouraging crop rotation, staying away from synthetic fertilizers and pesticides, and putting an emphasis on soil health through cover crops and composting. The goals of organic farming are to produce food in a more ecologically responsible way, improve biodiversity, and lessen the impact on the environment.

1. Integrated Pest Management
   A comprehensive method of controlling pests, Integrated Pest Management (IPM) blends chemical, mechanical, cultural, and biological techniques. It seeks to provide environmentally friendly and sustainable agriculture while reducing the negative effects of pests. IPM entails crop rotation, the use of natural predators, pest identification and monitoring, and the sparing use of insecticides. This strategy encourages ecological balance, lessens the need for chemical inputs, and assists farmers in managing pests in a more coordinated and efficient way.
2. Crop Rotation
   Two agricultural practices that include varying or rotating the types of crops grown on a certain plot of land are crop diversification and crop rotation. Crop

rotation enhances soil health, reduces the growth of pests and diseases, and encourages the cycling of nutrients. Cultivating numerous crops in one area is known as diversification; this practice reduces the risks associated with a single crop, improves biodiversity, and increases resilience to environmental changes. By encouraging a more resilient and balanced farming system, decreasing dependency on chemical inputs, and increasing soil fertility, these techniques support sustainable agriculture.

4.4. Social Responsibility in Tobacco Farming

Sustainable and ethical farming in agriculture requires fair labor practices and compensation. Farmworkers' well-being is influenced by the provision of fair wages, humane working conditions, and compliance with labor regulations. Addressing problems like child labor, discrimination, and giving employees the right safety precautions are all part of ethical considerations. Fair wages promote social fairness and assist local communities, which not only enhances the lives of agricultural laborers but also contributes to the farming industry's overall viability.

In order to achieve community empowerment and engagement in agriculture, it is necessary to promote cooperation, supply resources, and guarantee the active involvement of nearby communities. Sustainable development is promoted by this strategy by addressing community needs, including local knowledge in decision-making, and supporting initiatives that enhance social and economic well-being. Community engagement in agriculture guarantees that farming methods are ecologically responsible and culturally respectful, and enhance the community's overall resilience and profitability.

4.4.1. Post-Consumer Waste

Cigarette butts are the most littered object on Earth, discarded 4.5 trillion times annually. They rank second in the world for most frequently found litter on beaches and in waterways, typically accounting for between 30% and 40% of the items collected during annual coastal or urban clean-ups. Through their leaking of chemicals like nicotine, ethyl phenol, and even heavy metals in water, they pollute the ecosystem. People may not consider the possibility that the non-biodegradable plastic filters they use, when they discard their wasted cigarette butts on sidewalks, streets, and other public areas, could contaminate rivers, oceans, and beaches—that is, if wildlife does not eat them first. Animals who consume cigarette butts and contaminate water can be strangled or poisoned.

Supply networks in the agricultural sector encounter many difficulties, and the tobacco industry is no stranger to these intricacies. Tobacco multinational corporations need to demonstrate a commitment to sustainability that goes beyond their goods to the farmers who form the foundation of their supply chain. Tobacco Multinational Companies have built a rich history of promoting agricultural methods via direct collaboration with farmers worldwide. This promotes the prosperity and well-being of farmers in addition to guaranteeing the quality of the tobacco leaf.

Tobacco Multinational Companies focus primarily on two initiatives: the Sustainable Tobacco Programme, which rigorously evaluates suppliers against international standards, and thrive, an all-encompassing initiative that addresses long-term challenges for improved farmer livelihoods and sustainable agriculture. To safeguard the tobacco supply chain's future and improve farming communities, multinational corporations in the tobacco business must embrace collaborative techniques, multi-stakeholder problem-solving, and adherence to international standards.

4.4.2. Socio Economic Issue

Products that are connected to the manufacturing of tobacco both directly and indirectly are included in the category of Socio-Economic Issues. Tobacco cultivation is closely linked to the cost-effective production of a high-yielding, superior-quality crop that boosts farmer profitability. Even though it may not be as evident, the employment of child labor in the tobacco industry is a significant socioeconomic problem. Kids should go to school, not be used as cheap labor to produce tobacco.

Tobacco is occasionally produced using labor from farming families. When family labor is employed, it shouldn't prevent children or untrained individuals from participating in risky or hazardous jobs, nor should it prevent them from receiving other educational possibilities. Anytime hired labor is utilized to produce tobacco, all relevant labor laws must be followed, and all labor must be voluntary. The employees must be of legal working age, have access to a safe workplace, get regular pay at least the minimum wage set by law, be treated properly, and not frequently put in excessive amounts of overtime.

During their shift, employees should have access to potable water, sufficient handwashing and restroom facilities, and enough breaks. Accommodations are sometimes given to workers; these circumstances are usually related to migrant laborers. When lodging is offered, it should be secure and, at the very least, adhere to local housing codes.

Human rights protection is becoming more and more of a legal requirement in addition to an ethical one. Human trafficking, contemporary slavery, the employment of security personnel to safeguard property, and low-paying, irregular payment systems that equate to forced labor are only a few examples of human rights violations. Everyone involved in the tobacco supply chain has a responsibility to protect human rights by taking action to stop, lessen, and, where necessary, correct violations of those rights that they either cause or enable.

4.5. Technology Solutions for Sustainable Tobacco Production

Technological solutions are essential for addressing issues and promoting socially and environmentally responsible behaviors in sustainable tobacco production. These solutions address many facets of the tobacco growing process with the goals of increasing productivity, lessening the negative effects on the environment, and enhancing the welfare of farming communities. Cutting-edge precision agriculture technologies enable farmers to monitor crop health, optimize resource use, and react quickly to possible problems. These

technologies include drones, IoT (Internet of Things) sensors, and data-driven decision-making tools.

Innovations include water-saving devices, eco-friendly pest management strategies, and substitute curing techniques reinforce sustainable practices even further. The provenance of tobacco grown sustainably is ensured by blockchain and traceability technologies, which also increase supply chain transparency. The tobacco industry may support environmental protection, enhance the welfare of farmers and the earth, and comply with sustainability objectives by adopting these technology advancements.

In agriculture, digital tools for reporting and monitoring entail using technology to track and examine several facets of farm operations. These tools include mobile applications, satellite imaging, and sensor-based systems. Real-time crop health, weather, and resource utilization monitoring allows farmers to make well-informed decisions. These digital tools also make it easier to accurately report on certifications, compliance, and supply chain transparency. These technologies help to make agricultural processes more transparent, sustainable, and efficient by improving data-driven insights.

4.6. Sustainable Tobacco Certification Programs and Standards

Sustainable tobacco certification (Coresta, Coresta Technical Guide No 17: Sustainability in Leaf Tobacco Production, 2024), which requires the tobacco business to conform to socially and environmentally responsible practices, is significant. Programs for certification, such the Sustainable Tobacco Program (STP), concentrate on standards for fair labor practices, biodiversity preservation, water utilization, and soil management. These certificates seek to uphold moral standards in the production, distribution, and processing of tobacco while also encouraging sustainable farming and minimizing the negative effects on the environment. In a sector where the effects of its products on the environment and human health are coming under more and more scrutiny, certified sustainable tobacco shows a dedication to ethical behavior.

Industries aiming to tackle environmental and social issues must adhere to global sustainability standards. These recommendations for ethical corporate practices are provided by standards like those established by groups like the Rainforest Alliance and the Global Reporting Initiative (GRI). By guaranteeing that businesses fulfill environmental, social, and governance requirements, adherence to these standards promotes responsibility and openness. Along with helping companies meet global sustainability targets, it also improves their brand, draws in eco-aware customers, and advances a more moral and sustainable global economy.

4.7. Challenges and Future Outlook for Sustainable Tobacco Production

There are a number of obstacles to sustainable tobacco production, and these call for thoughtful answers to environmental, social, and financial issues. The environmental effects of conventional tobacco cultivation methods, such as deforestation, excessive pesticide use, and soil erosion, provide a significant obstacle. A major challenge is striking a

balance between maintaining ecosystem health and biodiversity and the demand for tobacco.

Since the tobacco industry has historically been criticized for its exploitative methods in some regions, social difficulties include issues like child labor. Tobacco production that is sustainable must prioritize community development, workers' rights, and fair labor standards. Because sustainable measures frequently demand upfront investments, farmers may encounter financial difficulties while switching from conventional to sustainable practices. Difficulties during the shift include securing access to sustainable farming supplies, implementing eco-friendly technologies, and managing any yield variances.

It is critical to adopt innovative and sustainable agricultural techniques, take part in fair labor initiatives, and provide farmers with transitional help in order to overcome these challenges and develop a more sustainable model for the production of tobacco. Reducing chemical inputs, increasing biodiversity, and emphasizing agroecological techniques are some of the emerging trends in sustainable tobacco growing. Sustainable certifications that prioritize fair labor standards, water management, and environmental protection include the Sustainable Tobacco Program (STP). Within the tobacco industry, there is a growing recognition of the need for sustainable farming practices that address environmental issues and meet the evolving customer demand for products obtained responsibly. These patterns point to a change in tobacco cultivation methods toward more socially and environmentally conscious ones.

Stakeholders are vital to the industry's sustainable future because they shape legislation, encourage cooperation, and raise consumer awareness. Businesses can adopt eco-friendly strategies, customers can prioritize ethical items in their purchases, and governments can enact rules that support sustainable operations. Conversations and actions for sustainable development are facilitated by NGOs and industry groupings. All stakeholders work together to create an industry that is more resilient and responsible, balancing social and environmental responsibility with economic success.

Regenerative agriculture is a method that can totally change the soil, replenishing essential nutrients and bringing biodiversity back (Trace X Technologies, 2024). A growing regenerative agriculture movement is being driven by farmers, activists, and companies in agriculture-reliant industries globally. To improve food production and restore natural ecosystems, regenerative agriculture is a viable solution. In regenerative agriculture, the land, water, animals, pollinators, people, and communities that maintain these systems are given priority, and their health is enhanced and preserved. In contrast to commercial agriculture, regenerative agriculture aims to preserve and honor nature's cycles. Utilizing techniques like crop rotation, cover crops, and minimal tillage, it focuses on enhancing soil health. Additionally, it stressed the use of a variety of plant species to enhance soil health and biodiversity as well as the integration of animals into agricultural systems.

CONCLUSION AND SUGGESTION

In conclusion, cooperation between farmers, governments, corporations, and consumers is necessary to achieve sustainability in agriculture. To overcome these obstacles and create a more sustainable tobacco production model, it is imperative to implement creative and sustainable farming practices, participate in fair labor initiatives, and offer support to farmers during the transition. A robust and ethical tobacco sector requires the adoption of technology, the implementation of environmentally friendly tobacco practices, and the promotion of ethical norms. To ensure that agriculture has a sustainable future that benefits present and future generations, it is imperative to strike a balance between economic interests and environmental, social, and cultural factors, as well as implementing regenerative agriculture.

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