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Economics of Producing Medicinal and Aromatic Plants

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Abstract:

Medicinal and aromatic plants (MAPs) are a significant focus in various industries due to their products. They are utilized in pharmaceuticals, health care items, cosmetics, and organic food. MAPs are gaining global recognition, with many pharmaceutical companies filing patents on these plants and their derivatives. Approximately 40% of newly approved drugs in the last two decades are derived from natural sources. The economic value of medicinal plants is influenced by numerous socio-economic factors, both locally and internationally. China leads in MAP exports with a 1.48% share, while India is the second- largest exporter with an 8.75% share in the Asian market. Despite the significant economic potential of MAP cultivation, it faces challenges such as lower prices, lack of transit markets, underdeveloped cultivation technology, and limited availability of resources and genetic materials. Therefore, governments should support the cultivation of MAPs.

Keywords: Medical and Aromatic plants, MAPs, Economics, Human Health, Medical and Aesthetics potential, Economic Parameters.

Introduction:

Aromatic plants contain volatile substances that produce odors, found in parts like roots, wood, bark, stems, foliage, flowers, and fruits, as essential oils, exudate gum, balsam, and oleoresin. These complex chemical compounds create distinctive fragrances. Essential oils, synonymous with fragrances, are called volatile or ethereal oils at normal temperatures and are concentrated but low in volume. Detailed information exists on the essential oils of about 500 species out of roughly 1500 aromatic plant species used in perfumery, with around 50 species commercially important. Essential oils have diversified applications in flavors, disinfectants, oral hygiene, cigarettes, pharmaceuticals, and more, representing about 17% of the global flavor and fragrance market. Annual production of essential oils ranges from 40,000 to 60,000 tons, with spice oils demanded at 2,000 tons

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per year. At the start of the 21st century, global consumption of flavors and fragrances was estimated at around $8 billion.

Turkey and Egypt are major exporters of aromatic and medicinal plants, with Hong Kong, Japan, China, Korea, Pakistan, and Singapore leading exports from South Asia. Pakistan, Bangladesh, Afghanistan, and the Maldives have also recognized the industry's importance, promoting commercial cultivation. Essential oils and chemical flavorings are key ingredients in many industrial products, including cosmetics, soaps, medicines, perfumery, confectionery, ice creams, disinfectants, tobacco products, and more. Natural substances are favored for being healthy and pleasant, fueling a green movement in consumer goods. As concerns over dwindling coal and petroleum resources grow, along with a return to natural products, the essential oil and fragrance industry is poised for a promising future.

Objective of the Research:

- Discuss the Economics of producing medical and aromatic plants.
- Evaluate the production costs involved in cultivating medicinal and aromatic plants, including land, labor, seeds, fertilizers, and other inputs.
- Investigate the demand and supply dynamics of MAPs in local, regional, and global markets.
- Identify key market players, distribution channels, and market trends.
- Analyze price volatility and factors influencing market prices.
- Determine the economic viability of MAP production for small-scale and large-scale farmers.
- Explore sustainable farming practices and their economic impacts on MAP production.

I. Economic Parameters to Understand the Value of Medicinal Plants:

In terms of species diversity, medicinal and aromatic plants (MAPs) are a significant part of human consumption from the natural world. The importance and benefits of these plants for people's livelihoods are immense. They contribute to financial income, cultural identity, healthcare, and livelihood security. However, their direct economic contribution to a country's economy can be measured in various ways (Hamilton, 2004). Over the past few decades, international trade in indigenous medicinal plants and plant-based drugs has grown significantly. A substantial portion of the economies in developing countries relies on this trade. With the increasing popularity of herbal products, this trade is expected to

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VOLUME 3, ISSUE 2, 2023, p 50 – 60
Print ISSN 2974-4407
Online ISSN 2974-4415

expand considerably by 2050 The trade in MAPs is a significant contributor to the GDP of agricultural sectors in agro-based countries or regions rich in natural vegetation. It is essential to explore the potential of MAPs as routine agricultural crops.

There are various indicators or parameters that represent the true value, sustainable cultivation, and trade of MAPs for the benefit of farmers and the nation. The main drivers for cultivating medicinal plants can be categorized into pull and push effects. Pull effects are factors that attract farmers to cultivate MAPs instead of traditional crops. These include

attractive prices, established market channels, price assurance by agents, and a monopoly by groups of producers cultivating these crops. Push effects stem from the uncertainties of net income from traditional seasonal crops due to market imperfections. Well-established market channels encourage farmers to grow MAPs. Consequently, current climatic changes and the low productivity of traditional field crops have significantly pushed farmers towards medicinal crops for profit maximization. MAPs create economic opportunities for vulnerable groups of farmers.

The value of medicinal plants is immense and multifaceted, encompassing economic, cultural, and healthcare benefits. They contribute significantly to financial income, especially in developing countries, through both local and international trade. Medicinal plants support cultural identities and traditional practices, providing essential healthcare resources for many communities. Despite challenges in market data and potential overexploitation, the growing demand for these plants underscores their vital role in livelihoods, sustainable agriculture, and economic development.

II. Economic Parameters of Local Market Value:

According to Williams et al. (2007), the market value of individual plant species is influenced by numerous factors, leading to significant variability.

-Generally, there is an inverse relationship between price per unit and the quantity of the product sold. Higher quantities sold tend to have lower unit prices compared to smaller quantities. For example, plant parts such as bark and bulbs, which are sold in larger quantities, typically have lower values than parts like fruits, leaves, and roots.

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Print ISSN 2974-4407
Online ISSN 2974-4415

-The price of harvested plant species varies based on the harvester's access to resources and the distance to trading markets from the harvesting sites.

-Prices also fluctuate based on negotiations between sellers and buyers in local markets for indigenous products.

-Information on purchase prices and actual quantities of medicinal plants sold is often sparse due to incomplete records and the sometimes-illegal nature of the trade. However, increasing demand can drive up both the value and quantity sold, potentially leading to resource overexploitation and variable prices.

III. Economic Parameters of International Market Value:

International market values and economic indicators of medicinal and aromatic plants (MAPs) are influenced by various factors. The basic principle of "supply and demand" applies to the international trade of these high-value minor crops . While their contribution to a country's agricultural output is relatively small, it has significantly increased over the past decade due to the growing global demand in the healthcare sector . Developed countries, including those in Europe and the USA, are integrating herbal products into their medicinal systems, driving up global demand for MAPs. This trend has created opportunities for exporting countries to increase their economic share in this sector. Major consumers of MAPs include the USA, Europe, and Japan, with around 30% of global exports coming from Morocco, Egypt, India, China, Albania, Bulgaria, Peru, and Chile. Approximately 80% of the world's MAPs supply is sourced from local indigenous plants. Key traded products include phyto-pharmaceuticals, nutraceuticals, and cosmeceuticals.

In recent years, the global demand for spices, herbs, and MAPs has surged due to the healthcare sector's interest in the therapeutic properties of phytochemicals from these plants. The industrial use of MAPs to produce herbal teas, extracts, decoctions, nutraceuticals, plant-based pharmaceuticals, and cosmeceuticals is growing faster than traditional medications. This sector has significant economic growth potential for countries. Many herbal drug precursor molecules, such as quinine from Cinchona officinalis and digitoxin from Digitalis purpurea, are obtained from MAPs and play a crucial role in international trade .The global market for herbal drugs was valued at approximately USD 23 billion in 2013, rising to USD 25 billion in 2015, and projected to grow at a compound annual growth rate of about 7%, reaching USD 36 billion by 2020.

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Additionally, there is a growing trend for personal care items and cosmetics based on natural ingredients, which have significant economic impacts. Enhanced technologies in skincare, haircare, and makeup products drive demand for natural ingredients like Aloe Vera, Ginkgo biloba, Panax species, Withania somnifer, and Serenoa repens, used for their therapeutic properties. The global market for cosmeceuticals was USD 44 billion in 2017 and is expected to grow annually by 7%. The market share of the USA grew from USD 2.8 billion in 2001 at an annual rate of over 7% through 2012, highlighting the substantial economic value of herbal products due to rising global demand.

Methodology:

I. Indicators for Sustainable Cultivation and Trade of MAPs:

The production, consumption, import, and export of medicinal and aromatic plants (MAPs) are key economic indicators. While it is challenging to determine precise global demand for MAPs, trends can be extrapolated from existing data. There is a growing human tendency to use MAPs for pharmacological and recreational purposes due to their cost-effectiveness, safety, and accessibility. The COVID-19 pandemic has further increased reliance on herbs for immunity, driving up demand since 2019. Multiple factors, including socio-economic, cultural, environmental, and geographical variables, influence the economic indicators of medicinal plants.

Several indicators reflect the sustainable cultivation and trade of MAPs. Socio-economic factors significantly impact the economic value of medicinal plants at both local and international levels. Surveys and research indicate that factors such as the number of farm patches owned by locals, marital status of cultivators, annual income from staple crops, and land use are highly influential on the consumption and trade of medicinal plants. To boost trade in medicinal plants, it is crucial to provide necessary facilities and financial support to interested growers. Studying cultural practices that enhance the harvesting and maintenance of medicinal plants at the local level is also recommended. The domestication

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Print ISSN 2974-4407
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of in-demand medicinal plants can positively influence trade. These factors contribute to the value of medicinal plants and can be observed through economic indicators.

Economic factors such as property and production value of the land used for cultivation depend on soil fertility and capacity to grow MAPs. Ecological factors, including the regulation of indigenous MAPs collection from the wild and strategies for conservation of species and ecosystems, are crucial to economic output. This knowledge can reduce anthropogenic pressure on natural resources for MAPs cultivation. These environmental factors play a significant role in determining the value of MAPs.

All these factors are interconnected, such as the socio-economic well-being of agricultural communities, efficiency indicators, and land use indicators. Efficiency indicators measure the use of resources per unit area and their impact over time relative to productivity demands. Land use indicators show the area dedicated to the production of in-demand medicinal plants.

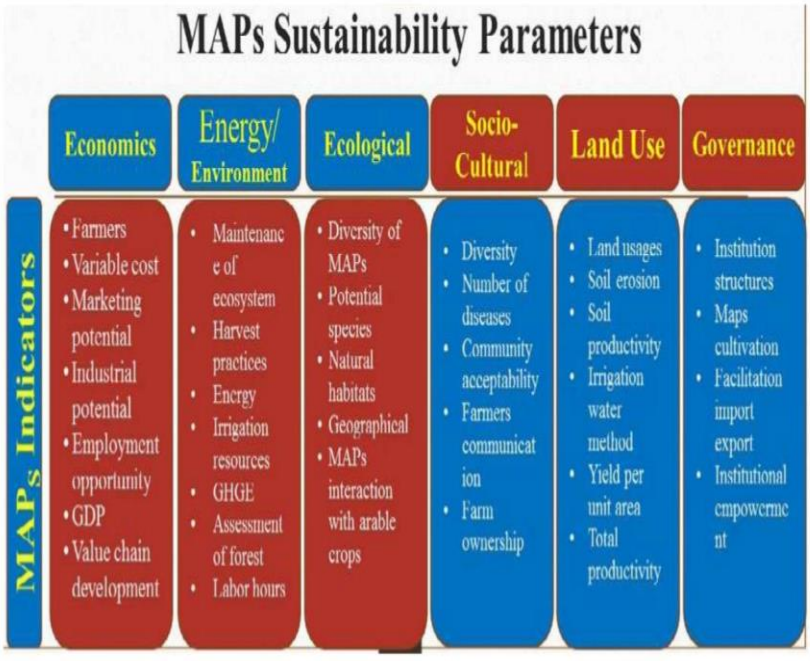

Figure 1: *MAP sustainability parameters.*

INTERNATIONAL JOURNAL OF MODERN AGRICULTUREAND ENVIRONMENT
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II. Economics of Producing Medicinal and Aromatic Plants in Egypt :

Egypt has a long history of cultivating medicinal and aromatic plants (MAPs), leveraging its favorable climate and rich biodiversity. The production of MAPs is an important segment of Egyptian agriculture, contributing to both local economies and export revenues. This analysis explores the economic aspects of producing MAPs in Egypt, focusing on costs, profitability, market dynamics, and the broader economic impacts.

A. Production Costs and Profitability

1. Cultivation Costs:

- Land: Cost of land varies significantly across regions. Fertile lands in the Nile Delta command higher prices compared to arid areas.
- Labor: Labor costs are relatively low due to abundant agricultural labor, but skill levels and productivity can vary.
- Inputs: Seeds, fertilizers, pesticides, and irrigation are essential inputs. The cost of these inputs depends on the plant species and the scale of production.

2. Profitability:

- Revenue: Revenue from MAPs can be substantial, especially for high-value crops like chamomile, basil, and mint. Prices fluctuate based on quality, demand, and market access.
- Yield Rates: Yield rates are influenced by agricultural practices, climate conditions, and pest management. Adoption of modern farming techniques can enhance yields.
- Cost-Benefit Analysis: Comparing the costs of production with revenue generated provides insight into profitability. For instance, organic MAPs often fetch higher prices, enhancing profitability despite potentially higher production costs.

B. Market Dynamics:

1. Domestic Market:

- Demand: There is a robust domestic demand for MAPs for use in traditional medicine, herbal teas, and culinary applications.
- Market Channels: Local markets, cooperatives, and wholesalers play key roles in distributing MAPs. Direct sales to consumers at markets or through community-supported agriculture (CSA) programs are also common.

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2. Export Market:

- Key Export Destinations: Egypt exports significant quantities of MAPs to Europe, the United States, and Asia. Germany, France, and the United Kingdom are major importers.
- Export Volumes: Export volumes have been rising due to increasing global demand for natural and organic products.
- Trade Agreements: Egypt benefits from trade agreements that facilitate easier access to European markets, enhancing competitiveness.

C. Economic Impact

1. Rural Development:

- MAP production supports rural economies by providing income and employment opportunities. It helps diversify income sources beyond traditional crops, reducing economic vulnerability.

2. Employment:

- The MAP sector employs a significant number of people, from cultivation and harvesting to processing and marketing. Women, in particular, benefit from employment in this sector.

D. Policy and Regulatory Environment

1. Government Support:

- The Egyptian government provides various forms of support, including subsidies for inputs, research and development initiatives, and training programs to enhance farming practices.

2. Regulations:

- Strict regulations ensure the quality and safety of MAPs, especially those destined for export markets. Compliance with international standards is crucial for market access.

3. Certification:

- Obtaining organic or fair-trade certification can significantly enhance the marketability and price of MAPs. The government and NGOs support farmers in achieving these certifications.

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Print ISSN 2974-4407
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Results of Study:

Challenges and Opportunities of producing Medicinal and Aromatic Plants:

Challenges:

-Water Scarcity: Limited water resources necessitate efficient irrigation methods and drought-resistant crop varieties.

- Market Access: Smallholders often face challenges in accessing lucrative export markets due to lack of scale, resources, and knowledge.

-Quality Control: Ensuring consistent quality is crucial for maintaining market reputation and meeting international standards.

Opportunities:

-There is growing global demand for organic MAPs, providing a premium price opportunity for Egyptian producers.

-Investing in processing and value addition (e.g., essential oils, extracts) can significantly enhance profitability.

- Utilizing modern agricultural technologies and practices can improve yields, reduce costs, and ensure sustainable production.

Conclusion:

The production of medicinal and aromatic plants holds significant economic potential. With strategic investments in technology, market access, and sustainable practices, the MAP sector can contribute substantially to Egypt's agricultural economy, providing income and employment opportunities, especially in rural areas. Addressing challenges related to water scarcity, quality control, and market access will be key to unlocking this potential. MAPs production is characterized by relatively low production costs and the potential for high profitability, driven by growing global and domestic demand. Key factors influencing the economic viability of MAP cultivation include market access, quality control, and the adoption of modern agricultural practices. Challenges such as water scarcity and market accessibility for smallholders must be addressed to fully realize the sector's potential. Overall, with strategic support and investment.

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Print ISSN 2974-4407
Online ISSN 2974-4415

Recommendations :

- Encourage the formation of cooperatives to help small farmers pool resources, improve bargaining power, and access larger markets.
- Establish better connections between producers and international buyers through trade fairs, export promotion programs, and online platforms.
- Implement training programs to educate farmers on best practices for cultivation, harvesting, and post-harvest handling to ensure high-quality products.
- Provide support for obtaining organic, fair trade, and other relevant certifications that can command higher market prices.
- Fund research on developing high-yield, disease-resistant, and drought-tolerant varieties of medicinal and aromatic plants.
- Promote the adoption of precision agriculture, integrated pest management, and sustainable farming practices to enhance productivity and environmental
- Invest in efficient irrigation systems and water management practices to mitigate the impact of water scarcity.
- Develop local processing facilities to add value to raw MAPs through the production of essential oils, extracts, and other products.
- Implement conservation programs to protect wild MAP.

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