

## Plant-derived stimulants and psychoactive substances – social and economic aspects

Barbara Sawicka<sup>1\*</sup>, Olutosin A Otegunrin<sup>2</sup>, Dominika Skiba<sup>1</sup>, Bernadetta Bienia<sup>3</sup> and Marek Ćwintal<sup>1</sup>

<sup>1</sup>Department of Plant Production Technology and Commodities Science, University of Life Sciences in Lublin, Poland

<sup>2</sup>Department of Agricultural Economics and Farm Management, Federal University of Agriculture, Abeokuta [FUNAAB], Nigeria,

<sup>3</sup>Department of Food Production and Safety, Carpathian State University in Krosno, Dmochowskiego 12, 38-400 Krosno, Poland,

### \*Corresponding author

Barbara Sawicka, Department of Plant Production Technology and Commodities Science, University of Life Sciences in Lublin, Poland

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### Abstract

*An analysis of the drug market was carried out, in the context of changing patterns of drug use, cultural and social factors as well as economic and links with wider crime. The drug markets remain one of the most profitable areas of economic activity of organized criminal groups. The impact of the drug market on society is enormous and goes beyond the immediate effects of their use. It involves participation in other types of criminal activity and terrorism, impact on legally operating companies and the economy, the burden on public institutions and corruption, as well as the impact on the whole society and its health. Globalization and technological development has accelerated the pace of changes taking place on the drug market. Geographically, this type of activity focuses on several existing for a long time, but also on new markets. Changes in this area pose a challenge for entities undertaking actions in response to problems related to the functioning of the drug markets, including those indirectly resulting from them. A detailed analysis of the conditions for growing the most common types of stimulants has also been made and the key information on this subject is presented in the following work.*

**Keywords:** Taxonomy, Plants, Stimulants, The Drug Market, Cultivation of Pseudo-Maintenance Plants, Socio-Natural Conditions, Drug Policy, Public Health

### Aberrations

BN – Betel Nut

BQ – Quid Betel

CLD – Chronic Liver Disease

COPD – Chronic Obstructive Pulmonary Disease

THC – Tetrahydrokannabinol

### Introduction

Classification of plants and crops is important for research, maintenance and use, and is based on differences and similarities, including preserving the reproductive capacity of organisms. There are many classification systems proposed by various taxonomists and many ways to classify crops, as illustrated in Figure 1. Geographically the division is [1-5]:

A. In the field of food economy: maintenance crops [in Latin alimentum - food] include: a) edible plants, used by humans as food [cereals, sugar plants, tuberous plants, legumes, oil plants, honey plants, vegetables and fruits], b) pseudo-alimentation plants: plants consumed for various purposes, but

having no nutritional value: stimulants [pseudo-alimentation], spices; c) non-maintenance plants – industrial [crambe, rape, flax, ram], d) fodder [fodder beet, clover, alfalfa, common sainfoin, serradella] [1, 3, 5];

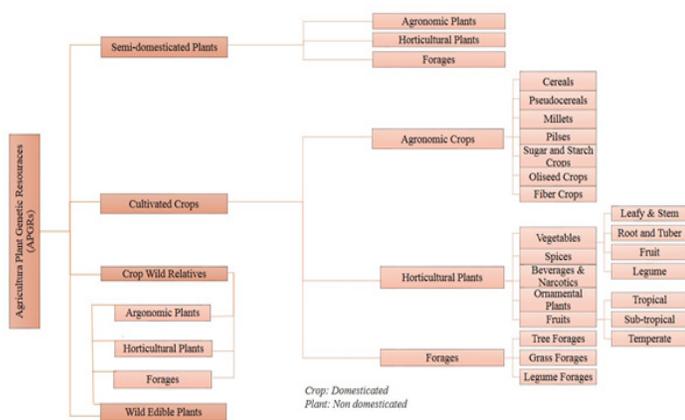
B. Division in geographical and agricultural terms: extensive, intensive, structure-forming cultures; cereal, oily, tuberous, legumes, fiber crops, fruits, vegetables, spices [2, 4].

The group of pseudo- alimentation plants does not include plants that are eaten for various purposes but have no nutritional value [so-called pseudo-food or pseudo-alimentation plants], such as: stimulants, spice plants and genetically modified [transgenic] plants [1, 3-6]. The most important pseudo-remanufacturing raw materials include: tea, coca, khat, betel, rustic tobacco, tobacco, called stimulants [4, 5]. Many definitions of stimulants are known, but the most important are according to:

- are products with no nutritional properties, containing substances that have a stimulating effect on the nervous system (e.g.: theophylline, caffeine, nicotine, ethanol, amphetamine,

khat);

- “psychoactive substance” means any substance that: (a) is able to produce a psychoactive effect on the user and (b) is not a substance excluded under other legislation. For the purposes of the Act, a substance triggers a psychoactive effect in a given person if, as a result of stimulating or depressive effects on the central nervous system, it also affects the psychological functioning and emotional state of the user and the psychoactive effects of a given substance should be read in a separate way” [7];
- a psychoactive substance that exerts a specific effect on the human body (most often on the central nervous system) or a product containing such substances, for example: coffee, tea, tobacco, rustic tobacco, betel, alcoholic beverages, energy drinks, aphrodisiacs [1, 6-10].



**Figure 1.** Classification of genetic resources of agricultural plants on the basis of economic importance Source: Authors’ construct

Psychoactive substances, also called psychotropic substances, are chemical compounds affecting the central nervous system through a direct influence on brain functions, resulting in temporary changes in perception, mood, consciousness and behavior. Psychoactive substances or substances containing them (stimulants) can be used for recreational purposes in order to cause a change in consciousness (e.g. coffee, alcoholic beverages, heroin, cocaine, marijuana), in some religious cults [e.g. containing mescaline cactus peyote, psilocybin mushrooms], in medicine (e.g. opioids and cannabinoids for relieving pain, as well as stimulants to relieve the symptoms of narcolepsy and ADHD, antidepressants and antipsychotics in neurology and psychiatry).

The use of many of these substances [especially stimulants and depressants] can lead to addiction and cause significant health damage. In turn other means, so-called psychedelics, sometimes help in the treatment of addictions [e.g. ibogaine, LSD]. Expression of the antiperspiration. While the old drug definition is on the “second thought”. The new definition is an even mix of four overlapping circles. While it is growing, it is a step in the right direction. For thousands of years’ people have been researching and evaluating psychoactive substances, both indirectly, through observations, and directly, by accepting them. However, always sentences on this subject were extremely divided, and their use for a long time was the subject of philosophical and moral disputes,

and even the reason for wars (e.g. opium wars) [11]. Most people use at least one psychoactive substance. In Europe, South America the most popular are: caffeine, alcohol and nicotine, while in Asia and Africa - khat, betel, marijuana, nicotine, in the order listed [12]. Many people accept the restrictions imposed by prohibition on the use of other substances, especially “hard drugs”, which are illegal in most countries of the world. Many of the most popular, used psychoactive substances, such as; alcohol, tobacco is legal, although many people put it on par with “hard drugs”. In turn, many so-called “Soft drugs” like cannabis, psilocybin is illegal and state control over them is very high (e.g. in the United States marijuana and psilocybin in the Controlled Substances Act are in the group of the most dangerous drugs). Many people think that the prohibitory law is of a political nature [13, 14]. Every day on the subject of each psychoactive substance there is a sharp discussion whether it is spiritual in nature, whether the substance is healing or poisonous, whether it is ethical or immoral, responsible or irresponsible, etc. These views are often deeply rooted in the philosophical and religious views of a given state [15-21]. It is very difficult to reach agreement in the moral and philosophical limits that are acceptable to all. An important point in the discussion is the role of law. The subject of the dispute is also whether the law should be neutral or prohibitive, or before buying a given substance should require a prescription, whether the marketing of the substance should be regulated, whether you should fight promotion, promote abstinence, or moderation, educate to increase security when using them, whether the current law is good or should be changed. Therefore, the aim of the work is to find answers to the above questions in the social and economic aspects, first of all to present an analysis of public health arguments, especially in the context of the economic situation of developing countries.

### Characteristics of selected pseudo-alimentation species *Thea Sinensis*

*Camellia sinensis* = *Thea sinensis*, f. *Cameliaceae* is a tree or shrub height from 3 m [cultivars] to 15 m [wild varieties], evergreen, with shiny and pointed leaves. Cultivated in many countries around the world due to donuts and leaves. The leaves are single, short-sided, sharp serrated, large, up to 25 cm long [usually 6-7 cm] and 15 cm wide [usually 3-4 cm], silvery hairy. The flowers are white, pale pink, fragrant, single or 2-3 in leaf angles, on short petioles. The fruit is a green-brown, woody bag, up to 1.5 cm long, containing 1-5 seeds. A pollinating plant creates many hybrids. The raw material is the leaves and buds of *Camellia sinensis*. The most popular botanical varieties are: Chinese tea [*Camellia sinensis* var. *sinensis*], comes from China. *Camellia sinensis* var. *assamica*, comes from India and the countries of south-east Asia. The plants are higher [up to 17 m] and its leaves are much larger as *Camellia sinensis* var. *sinensis*. Cultivated mainly in India, in Ceylon and Java. The tea includes, among others: caffeine – up to 4.5%; theophylline – up to 0.04%; theobromine – approx. 0.2%; purine principles – adenine and xanthine; tannins (up to 0.25%); polyphenols; catechins and their gallates, saponins, flavonoids; essential oils (linalool, geraniol, jasmon, etc.) [22-24]. Currently the tea has been consumed over the world and it is grown in more than 35 countries. The top eight countries including China, India, Sri Lanka, Kenya, etc. were contributed 86.5% of the total world tea production [25, 26].

## Arabic Coffee

Arabic coffee, Arabian coffee (*Coffea arabica*), family Rubiaceae, it is a shrub or a small tree. The genus *Coffea* includes about 40 species, including: arabic coffee (*Coffea arabica*); Liberian coffee (*Coffea liberica*); Congolese coffee (*Coffea canephora*). Shoots with opposite foliage. They grow vertically or at right angles. Dark green, leathery, elliptical, sharp-tipped leaves. White, short-stemmed or sessile flowers. It blooms and fruits the whole year. The fruit appears 4-6 years after planting. Arabica coffee flowers are capable of self-pollination, while in the case of *Coffea canephora* pollination is needed. The fruit is berry, formed in the ovary of a dusted flower, has a diameter of 15 mm, and when it reaches full maturity, it is similar to cherry. Seeds are white-beige, flat-convex, with a grooved cavity. The raw material is coffee seeds, called grains. Coffee seeds include: methylxanthine alkaloids: caffeine – up to 2.5%; theobromine; theophylline; chlorogenic acid [5%], tannic compounds, phenolic acids and sugars [27]. The main species of coffee in the world are Arabica and Robusta, in addition to the smaller quantities of *Coffea excelsa* and *Coffea liberica*. There is another division created by the International Coffee Organization (ICO). ICO isolated the following coffee groups: Colombian Mild Arabicas, Other Mild Arabicas, Brazilian Natural Arabica's, Robusta's [28].

## Cacao

Cacao - *Theobroma cacao* is a species of plant from the family mallow (Malvaceae), formerly classified as Sterculiaceae. It is an evergreen tree, 4-8 m high, propagated from seeds. Leaves oblongly ovate, leathery. Flowers pink to red, set on short stalks growing in bunches directly from the trunk and branches. This phenomenon is called kauliflora or kaulikarpia. The fruit is an elongated, multigrain berry. Inside the fruit there are 20-60 seeds – cocoa beans. Cocoa fruit has a green, yellow, red or purple color and a length of about 20 cm. Inside them, in the mucoid, juicy flesh, there are from 20 to 60 seeds called cocoa beans. The raw material is cacao semen – devoid of seed husks and rootlets, fermented, dried and roasted at 110-140°C [20, 29]. *Theobroma* - the active substance of cocoa seeds is one of the most concentrated sources of flavanols, a sub-group of natural plant antioxidants called flavonoids. These antioxidants, thanks to the properties of free radical's fight, prevent the oxidation of low-density cholesterol (LDL), which leads to atherosclerosis, help reduce platelet activation, improve blood flow through the ability to increase positive vascular action and cocoa endothelial function and modulate vascular homeostasis. Flavonoid-rich chocolate improves coronary dilation, indicates increased bioavailability of NO and reduces platelet reactivity. Flavonoid-rich cocoa increases the antioxidant capacity of serum and prevents lipid peroxidation. Activation of NO synthase and reduction of oxidative stress improve endothelial dysfunction and reduce platelet activation. The results suggest a short-term effect of dark flavonoid-rich chocolate in the development of coronary vasodilation, amelioration of coronary vasomotor capacity and platelet adhesion-dependent platelet adhesion. Flavanols, such as epicatechin and catechin, their oligomers, procyanidins have an inverse relationship between cocoa consumption and CVD risk, which indicates various potential bioactive activities in which flavanols participate, including improved vasodilation, blood pressure, decreased platelet reactivity, and improving the immune response and antioxidant defense systems. The beneficial cardio-

vascular effects of cocoa and its products play an important role in a well-balanced nutritional plan. However, further research is necessary to obtain more unambiguous statements.

## Khat

Khat, otherwise the gourd (*Catha edulis*) – is a tall shrub, or a tree that has evergreen, small leaves. The *Catha edulis* tree has a slender trunk and a white bark, from 1 to 18 m in height, they are cut annually to maintain their height to about 5 m. The leaves of this species contain a number of active substances. These include: cathinone, katyn and katyline, which in their structure resemble amphetamine. The effect after taking this leaves is faster than after amphetamine [30]. As a result of chewing khat leaves are extracted to 90% of the cathinone, which corresponds to a low dose of amphetamine. Africans cultivate this species, collect its leaves, and then use them as a means of relaxing and maintaining relationships between people. The raw material of *Catha edulis* are fresh leaves, dried leaves and khat powder (figure 2) [31].



**Figure 2.** Types of khat sold in Great Britain. Before the prohibition dominated fresh khat

Source: [https://www.researchgate.net/profile/Johan\\_Nordgren2/publication/278041013/figure/fig1/AS:267421760094286@1440769724616/Types-of-khat-sold-in-the-United-Kingdom-Fresh-khat-dominated-before-prohibition\\_W640.jpg](https://www.researchgate.net/profile/Johan_Nordgren2/publication/278041013/figure/fig1/AS:267421760094286@1440769724616/Types-of-khat-sold-in-the-United-Kingdom-Fresh-khat-dominated-before-prohibition_W640.jpg)

Africans have been chewing khat for a long time. Although it temporarily improves mood, it causes a lot of damage in the body. Khat owes its hallucinogenic action to psychoactive substances that are found in the leaves of this species. The main advantage of using khat, given by sellers, is social interaction. Khat contains cathinone, cathin and norephedrine – psychoactive substances with an amphetamine-like effect. For this reason, it is banned in many countries of the North. Anthropologists perceive the khat chewing in Africa and Arabia as an important community ritual. The so-called. “Khata’s feasts” - as was reported by anthropologist Susan Beckerleg in “Ethnic Identity and Development: Khat and Social Change in Africa”, where the use of khat united men, creating a substitute for what in Europe is called the public sphere. People would meet, calmly chew, discuss politics. After the initial moods of arousal and euphoria, they calmed down. In the perspective of such a khat should be perceived as an element of civilizational heritage, or at least as a commonly accepted custom of “table culture”. There is still no common legal interpretation regarding the harmfulness of khat [30].

## Coca, Common Truss

*Erythroxylon coca*, family Erythroxylaceae. Botanical varieties: *Erythroxylon coca* var. *coca* grown in Bolivia; *Erythroxylon coca* var. *truxillense* – grown in Java [leaves with a lower content of cocaine, *Erythroxylon coca* var. *novogranatense* – grown in Colombia [32-34]. The plant has 3-5 m tall. The leaves 5-8 cm long, evergreen, short-oval, narrow-oval, whole edge, gray

or pale green, strongly scented after trimming. The flowers are small, greenish-white, yellowish-white. The fruit is red drupe. The leaves [Folium Coca] are contained up to 2.5% cocaine and other ecgonine esters [32, 33]. In addition, the leaves contain of 14 active alkaloids (0.1-1.8%), of tropane derivatives: cocaine, as cinnamylococcine, benzylogonine: benzyloekognine, tryxiline, tropakococaine, pyridine alkaloids (hygrine and cousohigrin), oil (3-hexene-1-ol, 2-hexol) and tannins; vitamins, s in particular B1, riboflavin and vitamin C [32, 35]. The cocaine is a very strong stimulant, obtained from several species of *Erythroxylon coca* leaves; *Erythroxylum coca* var. *coca*; *Erythroxylum coca* var. *ipadul*; *Erythroxylum novogranatense* var. *novogranatense*; *Erythroxylum novogranatense* var. *truxillense*. Two species: *E. coca* and *E. novogranatense*, have been utilized for thousands of years specifically for their tropane alkaloid content. This plant grows in the Andes, in the region of South America [34]. Two main forms of cocaine are found in the trade: cocaine powder – commonly known as ‘coke’ or ‘blow’ - dissolves in water. Users can inject cocaine powder cocaine crack - commonly known as ‘crack’ or ‘rock’ - is produced in a chemical process [34, 35]. Although the abuse of narcotic cocaine has impacted society on many levels, these species and their wild relatives have an untapped resource in the form of food, pharmaceuticals, phototherapeutic products, and other high-value plant-derived metabolites. Cocaine is used in medicine as a local anesthetic. It is used, among others for anesthesia of mucous membranes, conjunctiva and cornea. It relieves the feeling of touch, pain, smell, taste and smell. At the same time, it evokes a spasm of blood vessels. Therefore, as a small number of local anesthetics, it can be administered without the addition of vasoconstrictive agents (the majority of drugs in this group causes the expansion of blood vessels, which speeds up their elution through the blood from the place of administration). It is practically not absorbed through the skin. After oral administration it is broken down in the digestive tract. Cocaine, however, has very strong negative effects on the heart, brain and emotions. Many users of cocaine have fallen victim to addiction, with long-term and life-threatening consequences. Even occasional users risk a sudden death using cocaine. Cocaine is a purified extract from the leaves of *Erythroxylon coca*. About 14% of adults in the US tried cocaine. Young men aged 18 to 25 are the largest users of cocaine, of which 8% have been in the last 12 months [32, 35].

## Cannabis

*Cannabis indica* – cannabis, f. *Cannabinaceae* (hemp) are the most popular drug in Europe. Originally, it occurred in the vicinity of the Hindukush mountains. They are used as a drug or a drug (e.g. marijuana), or a drug (reduces pain during chronic diseases) due to the presence of increased amounts of THC, compared with other species of hemp. The demand for hemp and its products has been consistently on the rise in the 21st century. Cannabinoids (phytocannabinoids) are naturally occurring compounds found in the cannabis plant. Endocannabinoids are substances produced in the body that activate cannabinoid receptors. Two species of cannabis, *Cannabis sativa* and *Cannabis indica*, and their resins contain hundreds of cannabinoids. *Cannabis sativa* also has THC – Tetrahydrocannabinol, *Cannabis indica* also has THC. The extracts of both plants are called medical marijuana; *Cannabis indica* extracts are not psychoactive. *Cannabis indica* resin is antiviral and inhibits cell proliferation. It contains approximately 60 cannabinoids.

It has higher efficacy than any single compound such as THC or CBD [36]. Hence, *Cannabis indica* accelerates recovery from coronavirus.

## Noble tobacco

Noble tobacco (*Nicotiana tabacum*), f. *Solanaceae*. This species is one-year, herbaceous, probably formed by the intersection of *Nicotiana silvestris* from *Nicotiana tomentosiformis* or *Nicotiana tomentosa* [1, 37-39]. The whole plant glandular and viscous hair. Stem up to 2-3 m tall. Large, elliptic, lanceolate, hairy leaves, entire margin, usually contain 1-3% nicotine; large, fragrant flowers, pink, red. Fruits ovoid, 2-chamber purse. The basic raw materials used in the tobacco industry are plants of the genus *Nicotiana*, belonging to the family *Solanaceae*. *Nicotiana tabacum* is the typical and most commonly used species in the industry from both Americas and Australia. *Nicotiana tabacum* L. (common tobacco) is just one of the 76 species of *Nicotiana* (*Solanaceae*) used for the large-scale production of various tobacco products for human consumption (smoking, chewing, sniffing) Noble tobacco (*N. tabacum* L.) is grown worldwide in many commercial varieties. Currently, these plants are grown in many other regions of the world. The chemical composition of the raw material: alkaloids (nicotine – 0.05-10.00%, nornicotine, nicotine, anabasin, nicotinic acid and its amide); tannins – 3-6%; coumarin (scopoletin); flavonoids (rutin); phenolic acids; resins; mineral salts (potassium nitrate); malic acid, oxalic acid. Nicotine –  $\text{NC}_5\text{H}_4\text{-C}_4\text{H}_7\text{N-CH}_3$ , 1-methyl-2-[ $\beta$ -pyridyl]-pyrrolidine, an alkaloid found in the leaves and roots of tobacco. It is a liquid with boiling point of 246°C, soluble in water and alcohol, exhibits optical activity (left-handed), in brown air [40]. *Nicotiana tabacum* L. alkaloids, and nicotine in particular, are secondary metabolites that are attracting wide attention in biology, commerce, society and medicine [41]. Commercial varieties of tobacco typically produce alkaloids of 2 to 6% of the total dry biomass. In typical commercial tobacco plants, nicotine makes up about 90% of the total alkaloids, and the secondary alkaloids, such as nornicotine (demethylated nicotine derivative), anatabine and anabazine constitute the majority of the remaining ones [42].

## Rustic tobacco

*Nicotiana rustica* – Rustic tobacco, Aztec tobacco, bakun, f. *Solanaceae* – nightshade, is an annual plant, does well in spring, heights up to 1 m, greenish-yellow flowers, but smaller than noble tobacco. It has thick, leathery, ovate leaves and contain 1.5-10% nicotine and 4.5-14% citric acid. The fruit is a purse. Dried leaves of this tobacco species contain up to 9% nicotine, i.e. 3-10 times more than noble tobacco [43]. However, due to the less pleasant smell, it is used to produce less noble tobacco products. *Nicotiana rustica* leaves accumulate a variety of specialized metabolites. Three pentacyclic triterpenes have been identified in the leaves: betulinic acid (252.78  $\mu\text{g g}^{-1}$ ), betulinic acid (182.53  $\mu\text{g g}^{-1}$ ) and oleanolic acid (69.44  $\mu\text{g g}^{-1}$ ). Dominant, free phenolic acids in leaves are: rosmarinic acid (4257.38  $\mu\text{g g}^{-1}$ ) and chlorogenic acid (1714.40  $\mu\text{g g}^{-1}$ ) and conjugated forms of vanilla (3445.71  $\mu\text{g g}^{-1}$ ), sinapic acid (1963, 11  $\mu\text{g g}^{-1}$ ) and a syringe (1784.96  $\mu\text{g g}^{-1}$ ). The main flavonoids in the leaves are: luteolin (960.44  $\mu\text{g g}^{-1}$ ), apigenin (880.66  $\mu\text{g g}^{-1}$ ) and hyperoside (780.72  $\mu\text{g g}^{-1}$ ). In addition, 19 components have recently been identified, the main of which were: phytol (43.68%), solanone (5.54%), cis-5-butyl-4-methyldihydrofuran-2 (3H) -one (5.23%), dihydro- $\beta$ -ionone (4.25%),  $\alpha$ -ionone

(3.54%) and  $\beta$ -damascenone (3.03%). The main volatile substances in concrete turned out to be isoamyl alcohol (28.82%), oxynicotine (9.02%), phytol (7.80%), 4-methyl-1-pentanol (6.33%), cotinine (5.55%) and 3-methyl-3-pentanol (4.09%). The resinoid composition of *Nicotiana rustica* leaves is dominated by: nicotine (39.75%), phytol (11.23%), eicosan (4.88%), diethyl phthalate (4.19%), dibutyl phthalate (3.48%) and solanone (3.27%). Concrete and resin have a weak antibacterial effect [43, 44]. Due to the content of poisonous substances, it is suitable for the production of natural pesticides [44]. Research by Popov et al. and Jassbi et al. reveals the enormous potential of *N. rustica* L. leaves as plant material rich in biologically active compounds, extending their importance beyond the production of tobacco products. Rustic tobacco leaves are a valuable source for the production of traditional-type aromatic products used in cosmetics or other areas [essential oils, concrete, resin], which revealed their specific volatile profile. These are the first data on the extraction of concrete and resin from *N. rustica* L. The results of these studies provide the basis for targeting the right fragrance products to specific applications and broadening the importance of the species [43, 44].

### Betel nut

The betel nut is the seed of the fruit of the areca palm. It is also known as the areca nut. *Areca catechu* L. belongs to the *Arecaeae* family, which includes 181 genera and 2,600 species with a wide variety of physical characteristics. Areca plants are usually palm trees that prefer a tropical and subtropical climate. The most frequently studied species of *Areca catechu* L. contains phytochemicals in the form of phenols and alkaloids with biological properties [45]. Common names, preparations and specific ingredients vary depending on the cultural group and the people who consume them [46]. Arecoline, the main alkaloid of betel nut areca, is cytotoxic, genotoxic and mutagenic in a variety of cells. It is strongly correlated with oral submucosal fibrosis, leukoplakia, and oral cancer, and has been found to induce toxic symptoms in the recipient's immune, hepatic, and other defense systems [46]. Betel nut is a stimulant drug, which means it speeds up the transmission of information between the brain and the body. Betel Nut (BN), Quid Betel (BQ) and their products are widely used as a socially approved chew product. Their addictive nature (BN/BQ) has made it widely used, making it the fourth most abused substance by humans. Gradually, other additives, including chewing tobacco, were added to the simple BN preparations. This addictive practice has a strong etiological correlation with human susceptibility to cancer, especially cancer of the mouth and oropharynx. The consequences of this common BN/BQ chewing habit, practiced by about 10% of the world's population, appear to be significantly related to the susceptibility to mouth, mouth and throat cancer. It has been found that adding tobacco to BN only slightly increases the risk of cancer [46]. Bethel is consumed as a psychostimulant by over 600 million people worldwide [47]. Betel chewing stretches from the African continent to the islands of Micronesia and has been common since the dawn of time. Like other psychostimulants, chewing betel nuts is known to induce a feeling of euphoria, well-being, a feeling of warmth and an increased ability to work [48].

### The Origin of Pseudo-Preservation Plants

The origin of the tea plant, China, where it was cultivated since 3 thousand years ago. In Japan, it appeared at the turn of the eighth and ninth century, and in India and Ceylon in the eighteenth centu-

ry. Currently, it is also grown in both Americas and some regions of Europe [Portugal, Sicily]. The first mention of tea was made by scientists from the writings from the third century after Christ, from the prescriptions of a Chinese doctor who recommended drinking this drug to improve concentration and mental performance. At the same time, tea was started, and plantations were organized. During the reign of the Tang Dynasty (618-906) was the biggest flowering of tea growing, considered the "golden age" of tea. The European continent first reached the continent of the Netherlands and Portugal in the 17th century, and through Dutch trading companies, it was delivered to Italy, France, Germany and Portugal. She reached England in 1658, and to Russia in 1676 [1,45].

Khat comes from the eastern part of Africa, currently grown mainly in Ethiopia, Yemen, Zambia, South Africa, Kenya and Somalia [49, 50]. The origin of coca bush (*Erythroxylum coca*): western part of South America, Andean region. Coca is as old as the domestication of plants. The remains of coca were found at archaeological sites in Peru; hence it is known that this plant has been grown for 4,200 years. Currently, it occurs only in cultivation, mainly in the Andes and the Malay Peninsula. Outside of South America, the coca bush grows in the USA (California, Arizona, New Mexico, Texas, Louisiana, Alabama, Mississippi and Florida), in Europe (Spain, Italy, Greece) and in New Zealand [50].

*Theobroma cacao* tree was domesticated and used during the central Holocene in the upper Amazon. Traces of cocoa, dated 5,300 years, found in the ancient ceramics of the Ecuadorian Amazon. This is the oldest current use of cocoa. It precedes the 1500 years of domestication of cocoa, made by the Olmec and Maya in Central America. It is located in the south of the Ecuadorian Amazon, at the archaeological site of Santa Ana-La Florida (SALF), located in Palanga, and updated 16 years ago by archaeologist Francisco Valdez and his French-Ecuadorian team (IRD/NPC) that these evidence. Mayo Chinchipe, which is the oldest American civilization in the current high Amazon, consumed cocoa continuously, from 5,300 years to at least 2,100 years. The use of cocoa was demonstrated by analyzing both the presence of starch granules, *Theobroma* characteristics, the presence of trace amounts of theobromine, the specific biochemical relationship of mature cocoa beans, and the presence of old cocoa's DNA in ceramic remains dating back over 5300 years (Lanaud). These ceramics come from tombs or home contexts: they show the use of cocoa as both a funeral offer and everyday food [29].

Tobacco comes from South America. He was known to Indians from South America for centuries, they have always been used in magical, religious and medical practices. In 1650, planters from Portugal already planted their plantations in South Africa, and the Spaniards cultivated tobacco in Indochina, Guatemala and the Caribbean Sea. The first American tobacco plantation was founded in 1612 in Jamestown. Rustic tobacco comes from South America, from the Andes region. The leaves of this species are used for the production of poorer quality tobacco [for chewing and for the production of snuff], it is grown extensively in the US, Russia, Ukraine, Southern and Central Europe and China [37].

*Areca catechu* is originally native to the Malaysian peninsula, but its use has resulted in a long history of cultivation and naturalization throughout South and South-east Asia. It requires a warm,

humid, tropical climate to thrive. Areca plants, generally referred as palms, prefer tropical and subtropical climates, but they are able to grow in nearly every type of habitat; thus, this is one of the best-known and most extensively cultivated plant families. *A. catechu*, which grows in much of the tropical Pacific, Asia, and parts of East Africa [45].

### The Economic Utility of Stimulants

The processing and sale of stimulants brings huge profits to large corporations in highly developed countries. Coffee seed (semen coffee) is used to obtain caffeine and medicinal charcoal. The drink in the form of infusion stimulates the central nervous system and the circulatory system (caffeine), slightly diuretic [theobromine], increases the secretion of gastric juice and bile (chlorogenic acid, caffeine). The seeds are used (after appropriate preparation) to prepare beverages as a stimulant of coffee. Coffee is produced in over 70 countries around the world. It is produced by over 25 million producers. Part of the coffee produced goes to the internal consumption of individual countries, and the remaining, usually a

much larger part, is intended for export, which is a significant element of their economies. Coffee is considered the most important commercial commodity after crude oil in the world. The market price of coffee (C-price) is a parameter that describes the value of the raw material.

Table 1 and 2 reveal the top 10 coffee exporting and importing countries in 2018. In 2018, coffee was the 121st most traded product, with total trade value of \$30.9billion. Brazil was the highest exporter of the product (Table 1) with total export value of \$4.52 billion having 14.7% global share [51]. The 2nd top exporters were Vietnam (\$3.08 billion) with 9.99% global share while Germany was the 3rd with \$2.53 billion export value in 2018. However, in Table 2, United States of America was the 1st top importer of coffee in 2018 with total import value of \$5.53 billion and 17.9% global share. The 2nd top importing country was Germany (\$3.27billion) with 10.60% global share while France was the 3rd [\$2.07 billion] with 6.70% global share [52].

**Table 1. Top 10 Exporters of Coffee [2018]**

Global Rank	Country	Export Value [\$]	Share [%]
1	Brazil	4.52B	14.70
2	Vietnam	3.08	9.99
3	Germany	2.53B	8.18
4	Colombia	2.35B	7.60
5	Switzerland	2.21B	7.16
6	Italy	1.71B	5.55
7	France	1.16B	3.74
8	Honduras	1.02B	3.30
9	Ethiopia	836M	2.71
10	Belgium-Luxembourg	824M	2.67
	<b>Others</b>	<b>10.66B</b>	<b>34.40</b>
	<b>World</b>	<b>30.90B</b>	<b>100</b>

Source: Authors' compilation from OEC, 2020b; M = Million, B = Billion

**Table 2: Top 10 Importers of Coffee [2018]**

Global Rank	Country	Import Value [\$]	Share [%]
1	United States of America	5.53B	17.90
2	Germany	3.27B	10.60
3	France	2.07B	6.70
4	Italy	1.82B	5.91
5	Belgium-Luxembourg	1.57B	5.08
6	Netherlands	1.37B	4.44
7	Japan	1.22B	3.94
8	Canada	1.18B	3.81
9	Spain	1.16B	3.76
10	United Kingdom	1.10B	3.56
	<b>Others</b>	<b>10.61B</b>	<b>34.30</b>
	<b>World</b>	<b>30.90B</b>	<b>100</b>

Source: Authors' compilation from OEC, 2020b; M = Million, B = Billion

From Table 3, coffee had a huge increase in global production

level from 7.86 million tonnes in 2004 to 10.30 million tonnes in 2018. Brazil is the highest producer of coffee with 3.55 million tonnes [34.52% global share] in 2018 [53]. The second top producer was Vietnam with 1.62 million tonnes and 12.51% global share

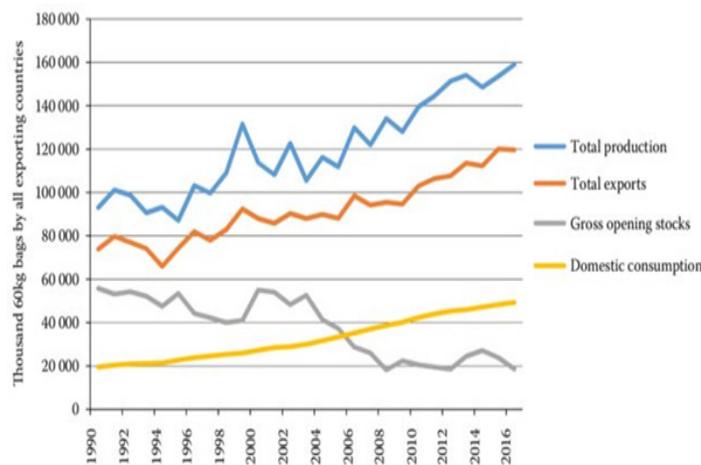
**Table 3: Global and Regional Coffee Production Levels [2004-2018]**

Year	World	Africa	Americas	Caribbean	Asia	Oceania
	Production [tons]					
2004	7,862,163	1,063,193	4,622,290	92,962	2,116,732	59,948
2005	7,390,107	984,259	4,292,759	103,896	2,036,916	76,174
2006	8,147,329	1,060,500	4,819,051	106,478	2,219,260	48,518
2007	8,137,937	99,9819	4,585,459	125,647	2,494,485	58,174
2008	8,490,000	1,079,152	5,044,666	93,804	2,304,398	61,784
2009	7,793,351	1,001,934	4,401,071	102,541	2,330,025	60,322
2010	8,477,507	1,085,219	4,960,559	84,671	2,379,412	52,317
2011	8,387,161	987,478	4,792,941	86,801	2,521,750	84,992
2012	8,822,841	975,107	5,174,050	87,588	2,629,959	43,725
2013	8,893,439	1,104,529	5,032,684	98,942	2,706,429	49,797
2014	8,761,695	1,117,023	4,860,667	68,138	2,728,231	55,773
2015	8,865,752	1,158,685	4,843,786	67,458	2,804,024	59,258
2016	9,353,937	1,171,138	5,285,689	74,010	2,838,307	58,803
2017	9,162,344	1,102,352	5,082,318	74,906	2,919,237	58,437
2018	10,303,118	1,171,129	6,007,503	80,901	3,066,416	58,070

Source: Authors' compilation using FAO Statistical database [53]

while India was the 3rd highest producer of coffee in 2018, with an estimated value of 722,461 tonnes with 12.3% global share [53].

The long-term results of the collective group of coffee exporting countries (PMG) indicate that there is a significant positive impact of coffee exports on their economic growth (Figure 3).



**Figure 3.** Production, consumption and export of coffee in exporting countries Source: International Coffee Organization [ICO 2018]

Andrzejuk, Fatemah & Qayyum, Anonymous, Murindahabi et al. also suggest political implications that promote the coffee sector in order to revive the economies of countries [54, 55]. According to Murindahabi et al., an increase of 1% in the longer term in coffee exports, it increases GDP by 0.0217%. Thus, coffee-producing countries can boost their economies by increasing production and export quality of coffee. The high comparative advantage in coffee production should be realized through a policy stimulating the coffee sector, considering other economic conditions growth in the open economy and placing them in the direction of coffee production and the export of this raw material.

**The Economic Importance of Cocoa:** cocoa powder for stimulating beverages, added to milk, ice cream and biscuits; cocoa butter is a valuable pharmaceutical raw material (for the production of ointments and suppositories), oil-free groceries from the seeds after grinding are processed into cocoa, food product, and seeds without shell, fermented, scorched, non-fat are used to make chocolate. In the cosmetics industry, cocoa powder is used for the production of eye-paints, lipsticks, moisturizing creams] and in the confectionery industry for making chocolate, whereas dark red cocoa wood is used for the production of veneers and fancy goods. The largest world producers and exporters of cocoa beans are West African countries such as Ghana, Côte d'Ivoire, with a total share exceeding 50% of world exports. The volatility

of production volumes depending on climatic conditions and internal political problems in cocoa export-dependent economies is the main cause of economic fluctuations. At the same time, the production and sale of cocoa beans is the basis for building the

development strategy of these countries [56]. The largest exporters of cocoa beans in 2018 were Côte d'Ivoire, Ghana, Ecuador, Nigeria, Cameroon, and the largest share in global exports was that of Côte d'Ivoire and Ghana (Table 4).

**Table 4: Global Imports and Exports of Cocoa Bean. Top 10 Exporters of Cocoa Beans [2018]**

Global Rank	Country	Export Value	Share
1	Cote d'Ivoire	\$3.52B	38.40%
2	Ghana	\$1.78B	19.30%
3	Ecuador	\$674M	7.33%
4	Nigeria	\$621M	6.75%
5	Cameroon	\$492M	5.35%
6	Belgium-Luxembourg	\$421M	4.58%
7	Netherlands	\$339M	3.68%
8	Malaysia	\$275M	2.99%
9	Dominican Republic	\$186M	2.02%
10	Peru	\$160M	1.74%
	<b>Others</b>	<b>\$720M</b>	<b>7.86%</b>
	<b>World</b>	<b>\$9.2B</b>	<b>100%</b>

Source: Authors' compilation from FAO and OEC, 2020a; M = Million, B = Billion

The largest cocoa importers in the world are the Netherlands, Singapore, Italy, and Spain. The largest importers of cocoa are the Germany, the US, Malaysia, Indonesia, Belgium, France, Netherlands, Germany and the USA (Table 5).

**Table 5: Top 10 Importers of Cocoa Beans [2018]**

Global Rank	Country	Import Value	Share
1	Netherlands	\$2.15B	23.30%
2	Germany	\$1B	10.90%
3	United States of America	\$927M	10.10%
4	Malaysia	\$812M	8.83%
5	Indonesia	\$628M	6.82%
6	Belgium-Luxembourg	\$552M	6.00%
7	France	\$395M	4.29%
8	Singapore	\$294M	3.20%
9	Italy	\$242M	2.63%
10	Spain	\$230M	2.50%
	<b>Others</b>	<b>\$1.97B</b>	<b>21.43%</b>
	<b>World</b>	<b>\$9.2B</b>	<b>100%</b>

Source: Authors' compilation from OEC, 2020a; M = Million, B = Billion

Cocaine is the most commonly used illegal stimulant in Europe. The value of the cocaine retail market is estimated to be at least EUR 6 billion per year (between 4.5 and EUR 8.0 billion). Cocaine goes mainly to the countries of Western and Southern Europe, and its consumption is fairly stable. Cocaine comes to Europe mainly from Colombia, Brazil and Venezuela, from where it is transported

by sea. Wholesale cocaine deliveries to Europe remain dominated by Colombian and Italian criminal groups working in partnership with other groups (e.g. the Dutch, British and Spanish). West African groups, especially in Nigeria, are also actively involved in the transport of cocaine from Africa to Europe [57].

Law enforcement agencies in Europe must to fight drug trafficking. There have been many drug confiscations in recent months. For example, in late March, Dutch law enforcement seized 2,000 kg of cocaine in the port of Rotterdam [53]. Cocaine confiscations destined for Europe also took place during the control of maritime trade in Colombian ports (table 6). From January to May 2020, 10 confiscations of cocaine were made in Colombia's ports, half of which were destined for Belgium [73%].

**Table 6: Cocaine destined for Europe seized in Colombian ports, 1 January to 16 May 2020**

Port of departure	Destination	Quantity [kg]
Santa Marta	Hamburg, Germany	62
	Antwerpia, Belgium	475
Cartagena	Leixões, Portugal	9
	Rotterdam, Netherlands	20
	Antwerp, Belgium	363
Barranquilla	Sweden [*]	322
Urabá	Antwerp, Belgium	300
Total		1 551

[\*] Port not specified; Source: Colombian National Police contribution to Europol

Currently, the price of coca leaves in Peru has dropped by as much as 70%. Border closure and movement restrictions complicate the shipment of leaves to cocaine plants, which could have had an impact on sales volume and hence price. Disruptions in cocaine production do not become apparent in Europe for some time. The COVID19 pandemic does not appear to have peaked in major cocaine producing and maritime loading areas in South America [Stargardter and Jorgic, 2020]. Border closure and movement restrictions make it difficult to transport leaves to cocaine plants, which can have an impact on sales volume and, ultimately, price. However, any disruptions in cocaine production do not become apparent in Europe for some time. The pandemic has yet to reach its peak in the major cocaine producing regions and regions with sea loading points in South America. Law enforcement agencies in these regions should step up their policing efforts, limiting the opportunities available to engage in the fight against drug-related crime. There is a risk that this could lead to fewer checks at departure points and result in an increased flow of cocaine to key entry points in Europe in the next few months [EU Drug Markets Impact of COVID-19, 2020].

**Table 7: Amount of cocaine seized in selected Member States, 2017 to end of March 2020 [tonnes]**

Specification	2017 [whole year]	2018 [whole year]	2019 [whole year]	2020 [January to end March]
Belgium	44.6	52.8	63.7	18.0
France	17.5	16.4	9.0	4.0
Germany	8.2	5.6	10.0	2.7

Source: contributions to Europol by Belgium, France and Germany. Seizure data were contributed to Europol by Member State law enforcement authorities

The experts from seven countries [Austria, Belgium, Czech Republic, Finland, Hungary, Latvia, Sweden] reported no changes in the terms of the size of individual cocaine shipments imported to the EU (Table 7). The Netherlands, Belgium and Spain are the main entry points and distribution for cocaine in the EU [58].

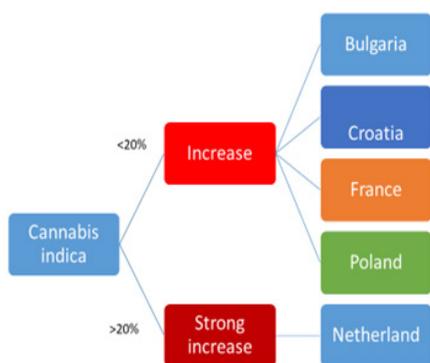
Hemp is a multi-purpose plant supplying fibers, Shiva, seeds and pharmaceuticals. At present, the fiber is used for the production of light papers, insulating materials and biocomposites. The inner core stems and postharvest wastes are used for mulching in animal husbandry. Hemp fruits, small nuts with high nutritional value, can be eaten raw or squeezed out into oil that has an excellent and unique fatty acid profile. Both seeds and oil are used for human nutrition and animal feed. Non-psychoactive Cannabinoid CBD is an interesting pharmaceutical and food supplement also derived from industrial hemp. Industrial hemp was an important

crop in many European countries, including Great Britain, France, the Netherlands, Germany, Spain and Italy. The most important applications for strong fiber were canvas for sails and sacks, water canvas for snakes and fabrics, as well as ropes. Currently, cannabis is a niche crop cultivated for 25,000 ha in the European Union [59]. Due to the unique properties, in particular the environmental benefits and the high performance of natural technical fibers, hemp is a valuable crop plant based on biofuels. Recently, cannabis has been legalized in subsequent US states, including the largest – California [60]. In mid-2018, up to eight states in which marijuana “recreational” is legal, will join the ninth. Legalization is accompanied by educational and social campaigns. A total of 31 US states allow the use of marijuana for medical purposes [in addition, in some cases, the use of hemp in special cases, e.g. in severe epileptic states is allowed]. US federal law still prohibits possession of drugs, but the decriminalization of this practice dates

back to the 1970s. The first state that legalized cannabis for non-medical purposes is Colorado, with 5.5 million inhabitants; it was in 2013. State authorities publish a report every year discussing the socio-economic effects associated with the legal turnover of cannabis. The latest report reports, among others about an increased number of car accidents involving people under the influence of cannabis. There was also an increase in the consumption of this drug among young people. In Europe, cannabis is the most commonly used drug. In 2017, EU countries reported over 780,000 seizures of products from this plant – marijuana, hashish, plants and oil. According to the EMCDDA, cannabis products were used by 18 million young people in EU countries aged 15-34 [61].

The cannabis products market is the largest drug market worldwide, including in the EU. There are two main illegal cannabis products in Europe: marijuana and hemp resin. Demand for cannabis products has not changed significantly. There was an initial peak in the demand of many users of cannabis products, but now there is no evidence to suggest significant changes since then. Little information is available on the impact on usage patterns but a small-scale study of cannabis users by the Trimbos Institute in the Netherlands found that 2 out of 5 cannabis users started using more.

**Herbal Marijuana:** There does not appear to be an immediate impact of the COVID-19 pandemic on domestic herbal production. Among the 14 EU countries surveyed, participating in the EMCDDA survey (Austria, Belgium, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Hungary, Latvia, Lithuania, the Netherlands, Romania, Sweden), only Bulgaria recorded a decline in cannabis production. Changes in the wholesale price of a kilogram of marijuana during the COVID-19 pandemic were not significant, only in the Netherlands they were higher than in other EU countries (figure 4).



**Figure 4.** Changes in the Wholesale Price of a Pound of Cannabis During the COVID-19 Pandemic Source: Authors' compilation

Tobacco is grown all over the world as an industrial plant, a stimulant. The economic importance of this species lies in the use of leaves as a raw material for the production of cigarettes, cigars, pipe tobacco, chewing tobacco, wet and dry snuff, water pipes, chopsticks, as well as cigars and cigarillos. The seeds yield oil and protein. The flowers are used to obtain the extract. In the industry,

it is used to obtain citric and malic acid and to make nicotinic acid and its amide. From the waste [crumbs, nerves, tobacco dust] are obtained a foil. The form the leaves „veins” produce cellulose, as a substrate for mycelium, etc. Leaves of tobacco and pure nicotine are a component of insecticide preparations. Tobacco are also used in medicine and tanning. Currently, the most popular form of tobacco consumption is a cigarette, i.e. a product consisting of a tube covered with a thin tissue [thimble] with a diameter of up to 1 cm and a length of up to 12 cm (usually 85 mm). In the interior of the paper there is a mixture containing prepared leaves of different varieties of tobacco with the addition of preservatives and improving the taste and market value of the product. Currently the most popular are cigarettes with a carbon or acetate-carbon filter, which partially retains the smoke particles. Tobacco leaves are often supplemented with substances that improve the physical characteristics of a cigarette, so-called sauces and flavoring substances. Some producers enrich their products with an additional portion of nicotine or ammonia, which by changing the pH of the glowing cigarette activates the nicotine contained in it. Approximately 600 such substances are allowed in the world.

Table 8 and 9 show the top 10 raw tobacco exporting and importing countries in 2018. In 2018, raw tobacco was the world's 298th most traded product, with total trade of \$11.4 billion. Brazil was the highest exporter of the product (Table 8) with total export value of \$1.96 billion having 17.2% global share. The 2nd top exporters were USA (\$989 million) while Belgium-Luxembourg was the 3rd ranked with \$920 million export value in 2018. However, Belgium-Luxembourg was the 1st top importer of raw tobacco in 2018 with total import value of \$1.76 billion and 15.5% global share. The 2nd top importing country was Germany (\$802 million) with 7.04% global share while Poland was the 3rd (\$640 million) with 5.62% global share (Table 9).

**Table 8: Top 10 Exporters of Raw Tobacco [2018]**

Global Rank	Country	Export Value [\$]	Share [%]
1	Brazil	1.96B	17.2
2	United States of America	989M	8.69
3	Belgium-Luxembourg	920M	8.08
4	Malawi	694M	6.1
5	India	652M	5.73
6	China	606M	5.32
7	Zimbabwe	467M	4.1
8	Turkey	424M	3.72
9	Germany	422M	3.71
10	Italy	370M	3.25
	<b>Others</b>	<b>5.86B</b>	<b>34.1</b>
	<b>World</b>	<b>11.40B</b>	<b>100</b>

Source: Authors' compilation from OEC, 2020c; M = Million, B = Billion

**Table 9: Top 10 Importers of Raw Tobacco [2018]**

Global Rank	Country	Import Value [\$]	Share [%]
1	Belgium-Luxembourg	1.76B	15.50
2	Germany	802M	7.04
3	Poland	640M	5.62
4	United States of America	614M	5.40
5	Indonesia	590M	5.19
6	China	587M	5.15
7	Russia	473M	4.15
8	Turkey	370M	3.25
9	Netherlands	328M	2.88
10	Egypt	302M	2.65
	<b>Others</b>	<b>4.53B</b>	<b>43.17</b>
	<b>World</b>	<b>11.40B</b>	<b>100</b>

Source: Authors' compilation from OEC; M = Million, B = Billion

**Raw Tobacco:** From Table 10, raw tobacco had a slight reduction in global production level from 6.56 million tonnes in 2004 to 6.09 million tonnes in 2018. China [mainland] is the highest producer of raw tobacco, producing 2.24 million tonnes with 36.77% global share in 2018 [26] The second top producer was Brazil

with 762,266 tonnes and having 12.51% global share while India was the 3<sup>rd</sup> highest producer of raw tobacco in 2018, producing an estimated value of 749,907 tonnes with 12.3% global share [26].

**Table 10: Global and Regional Raw Tobacco Production Levels (2004-2018)**

Year	World	Africa	America	Caribbean	Asia	Europe	Oceania
	Production [tons]						
2004	6,558,254	455,351	1,690,382	42,851	3,909,239	499,026	4,256
2005	6,721,310	497,922	1,548,141	38,850	4,191,925	479,133	4,189
2006	6,542,296	445,414	1,573,459	42,337	4,179,685	339,150	4,588
2007	6,165,596	497,485	1,583,837	41,578	3,742,267	337,477	4,530
2008	6,647,544	596,226	1,513,058	33,274	4,210,484	323,298	4,479
2009	7,142,371	657,625	1,537,570	39,718	4,599,563	343,208	4,405
2010	6,944,875	62,6299	1,402,396	31,226	4,583,858	328,133	4,189
2011	7,481,169	721,080	1,524,975	32,901	4,927,010	304,129	3,975
2012	7,593,955	612,116	1,441,317	31,185	5,270,977	265,817	3,727
2013	7,606,741	667,653	1,466,341	35,763	5,199,347	269,882	3,518
2014	7,287,346	719,429	1,565,042	31,491	4,729,004	270,566	3,305
2015	6,784,626	697,089	1,469,261	39,904	4,369,861	245,013	3,403
2016	6,361,725	719,518	1,213,301	31,056	4,188,875	236,706	3,325
2017	6,512,263	778,072	1,472,554	42,047	4,024,516	233,921	3,199
2018	6,094,875	668,972	1,277,966	43,154	3,926,218	218,602	3,117

Source: Authors' compilation using FAO Statistical database [26]

Areca catechu palm trees are cultivated in the tropical countries as a seed crop. They are cultivated in most of the South Asian countries, among them India and China. These nuts are also well known for chewing so-called “supari” by most of the people. It is a very widely cultivated plant in eastern countries like India, Bangladesh, Ceylon, Malaysia, the Philippines, and Japan. The species is also grown in East Africa, Madagascar, Arabian Peninsula, Sri Lanka, Myanmar, Thailand, Cambodia, Laos, Vietnam, southern China, Indonesia, Taiwan, Papua New Guinea, Solomon Islands, Fiji, Micronesia, and some atolls. Large quantities of Areca nuts are exported from Madras, Singapore, Penang, and Sri Lanka [54, 57].

### Production of Pseudo-Alimentations Plants

Most crops of pseudo-alimentation plants are concentrated in the tropic and subtropical zones.

Tea bushes are planted in 58 countries on five continents, most of which are located in Asia and Africa. The total area of land under tea cultivation is 4.37 million ha, with an annual production of 5.30 million tons in 2015. The main production of tea, especially in mountainous regions, is given by small and medium producers. It is estimated that there are 20 million and 3 million rural workers in the production and processing of tea in China and India [63]. Tea is harvested by hand, because the plantations are located on very steep slopes, several times a year. From each bush, only two leaves are collected at once, and the next harvest in the same place takes place after about two weeks, so that the bushes will be able to release new leaves [64].

Coca bushes are grown almost exclusively on the territory of Colombia, Peru and Bolivia. Estimated global coca acreage increased in 2014 and reversed the trend declining crops due to the changing situation in Colombia. However, little is known about the amount and location of cocaine production as available estimates are inconsistent. The only globally available data on pure cocaine production is around 700 tons per year. Estimated data on coca bush production volumes are uncertain and are practiced almost exclusively on the territory of Colombia, Peru and Bolivia [65]. The estimated global area of coca cultivation increased significantly in 2014, which is a reversal of the downward trend observed in previous years, mainly due to the change in the situation in Colombia. However, little is known about the number and location of cocaine production because these data are divergent, even if the captured cocaine is not a pure product.

Coffee bushes are grown on plantations in the tropics of Africa, South America and Asia. Most often these are: Arabica coffee (*Coffea arabica*) – 90% of world production] and Robusta coffee (*Coffea canephora*) – 1/3 of the world’s coffee production. Cultivation of coffee is labor intensive. According to some estimates, approximately 17-20 million households are involved in the cultivation of coffee, and about 100 million people in the world derive direct benefits from the coffee trade. According to the Food and Agriculture Organization of the United Nations – FAOSTAT, in 2016, 8.9 million tons of coffee beans were produced [66]. World coffee production in 2019/2020 coffee year is predicted to be 0.9% lower at 167.4 million bags, with a 2.7% drop in Arabica production to 95.68 million bags, while Robusta production may increase by 1.5% to 71.7 million bags. South

American production is also expected to decline by around 3.2% to 78.1 million bags, due to a decline in Arabica production in Brazil beyond the two-year harvest cycle. In addition, production in Asia and Oceania is projected to increase by 1.9% to 49.6 million bags, as a result of the recovery in Indonesian production, while production in Vietnam will remain stable. Central America and Mexico can expect an increase of 0.9% to 21.5 million bags, while production in Africa will fall by 0.6% to 18.2 million bags. World coffee consumption growth is likely to slow down in 2019/20, in line with slower growth in the global economy, and demand is expected to rise 1.5% to 168 million bags.

The main areas of khat cultivation and production are in Ethiopia, especially in the Harar region and in Yemen, because the agro-climates in different parts of Ethiopia are suitable for Khat production. The *Catha edulis* plant cultivation has come to common and expanded from southeastern to northwestern part of the country since the 1990s. To a lesser extent, *Catha edulis* is grown on the slopes of Mount Kenya, where it grows wild in many mountainous parts of eastern Africa, including South Africa, Uganda, Tanzania, Rwanda and Zimbabwe. The production of khat is profitable for a huge number of people involved in its production and marketing, including farmers, distributors and traders. Taxes on this account are also an important source of income for the governments of countries where it is cultivated. In Ethiopia, 85-90% of the produced khat is exported, and therefore constitutes a very significant contribution to the state’s income [67]. In Yemen, even before oil production, khat accounted for 30% of Gross Domestic Product [GDP]. However, as a Yemeni khat is not exported, its macroeconomic significance is not the same as in Ethiopia [68] [5,51].

Yemeni women are more involved in agriculture than men, especially in the mountains and high plateaus, but these regions are shifting from irrigated agricultural regions, and in practice this means unbalanced agriculture. Women, therefore, are less involved in such difficult conditions. However, at the same time, more and more people are migrating to cities or to the Persian Gulf countries to find a job. In Arab countries, women are more involved in the management of water resources in both irrigated and non-irrigated agriculture systems. However, profitable plants leave human responsibility, where the participation of women is not so obvious. In intermediate zones located between high plateaus and coastal areas, women continue to maintain the functioning of agriculture and try to counteract water shortages. Here, traditional farming is mainly based on agriculture in a semi-permanent dryland, which is maintained and managed by women, while young girls take on the responsibility of drinking water, as well as other duties related to water. Adult women in Yemen are also largely responsible for daily agricultural activities, while men are only responsible for seasonal work, but cooperate in important activities such as plant harvesting. These regions today suffer greatly from land degradation and erosion and are neglected in terms of sustainable agricultural practices [68].

Cannabis production in Europe covers a wide range of practices: from small-scale cultivation and for personal use to huge plantations. Although some large-scale crops are located in arable fields, but also cannabis is often grown indoors or underground;

such crops constitute a huge fire hazard. Hemp is widely available in Europe in two forms: as marijuana and hashish. Increased cannabis production in the EU over the past 10 years has led to a shift in the market: local cannabis production is increasing in many countries, replacing imported hashish. However, large amounts of hashish are still imported, mainly from Morocco, and marijuana comes to the EU from many other countries. In recent years, intensive and sophisticated cultivation techniques, together with the availability of high-content cannabis strains drugs have contributed to the increased potency of hashish and marijuana. The prevailing competition in the cannabis market makes the above trend an additional incentive for Moroccan hashish producers who are growing new hybrid strains of high-yielding and potent cultivars cannabis [69].

In 2018, the largest tobacco growing area in Europe was in Italy (over 17 thousand ha), Poland and Greece (16.4 thousand and 16.1 thousand ha, respectively). The highest yields of tobacco leaves were recorded in 2018 in Cyprus (over 43 thousand hectograms per hectare), Italy (around 34.5 thousand hectograms per hectare) and Spain (around 30 thousand hectograms per hectare) [70].

Tobacco growing and production translates directly into the economic impact of this sector on the national and global economy. Modifications covering the regulatory environment are automatically reflected in the condition of the entire tobacco sector and significant financial losses for the state budget, and directly contribute to the development of the so-called the gray area. The existence of differences in the legal classification of tobacco sector products, as a result of the above activities, the product is subject to regulations covering health protection, transport monitoring and excise tax policy [69]. The regulatory environment changes the essence of the legal classification of raw tobacco, which after processing ceases to be treated as an agricultural product and obtains the status of a so-called stimulant [70].

Growing tobacco is currently becoming unprofitable. This is due to the high labor consumption of tobacco growing and high labor costs, which means that tobacco production in Europe is not very competitive, in relation to developing countries with high resources of cheap labor and favorable climatic conditions. Tobacco growing has so far been supported in the EU with complementary payments. It allowed to rebuild the tobacco growing area. Limiting the tobacco cultivation support by the European Commission means that the production of raw tobacco in the EU is decreasing, and Poland remained one of its largest producers, not only in Europe, but also in the world. Work efficiency and processing efficiency have significantly improved. The production of cigarettes and cigarillos increased in the years 2002-2012 by 86% to 150 billion pieces, and the work efficiency measured by the sales value per 1 employee increased by 35% to over 700,000. In 2012, however, the raw material base and tobacco processing are among the most fragmented, despite the progress made in the previous decade [71, 72].

The cultivation of pseudo-assembly plants, most often in monoculture, leads to the soil being sterilized. The costs of cultivating stimulants are the sum of land costs, soil fertilization,

plant care and the work of the local population. The price of stimulants is a resultant of: business fluctuations, natural disasters, political and monetary situation, the sales policy of the producer. It is shaped by the cyclical fluctuations on the world market [72, 73].

According to Food and Agriculture Organization Corporate Statistical Database, in the world there is approximately 1 Mha cultivated of Areca nuts with a production of ca 1.2 Mt. The first producer is India, with 700,000 t, covering ca 58% of the total world production; Myanmar and Bangladesh are second and third, each covering ca 10% of the world, following by countries with minor production. Palm cultivation can be a promising sector for the rural economy not only in Asia but also in Africa and generally in subtropical and tropical climates if the marketing system is well developed and reduces the involvement of intermediaries in business [73].

### **The Drug Market of Stimulants**

Three-quarter (3/4) of production of stimulants, in the majority of poorly developed countries, is exported. The largest tea producer in the world is India, which produces over 715 thousand. tons of this resource annually. Tea is grown there in three areas: in the north-eastern area of the country in the province of Assam, high-quality tea in the province of Darjeeling at the foot of the Himalaya mountains and in the southwestern region of the Kerala region. In second place, in terms of tea production in the world, there is China with production of over 610 thousand. tons per year, although they spend less on exports than Sri Lanka, with more than 250,000 tons in a year. Sri Lanka produces the most recognized Ceylon tea by amateurs. Tea is also produced in Kenya (around 250,000 tons per year), in Indonesia (around 140,000 tons per year), in Turkey (around 140,000 tons in a year), in Japan (around 90,000 tons in year), in Tanzania, Rwanda, Zimbabwe, Papua – New Guinea, or Bangladesh. Tea is one of the most important profitable crops in the world, plays an important role in rural development, poverty reduction and food security in developing countries. Tea also plays an important role in relation to economic development. For example, in Sri Lanka, it generates USD 1.3 billion of exports, which is 14.8% of total export income or 59.7% of income from exports of agricultural products. Tea exports contributed to 20% of the total national income in Kenya. World production of black tea is expected to increase to 4.4 million tons in 2027, which reflects a significant increase in production in China, Kenya and Sri Lanka – thanks to this China will achieve the highest levels of production as the largest exporter of black tea in the world. Global production of green tea is expected to grow even faster at 7.5% per year to reach 3.6 million tons in 2027, largely due to China, where green tea production is expected to increase more than double from 1.5 million tons in 2015 to 3.3 million tons in 2027 [72-74].

Coffee is one of the most valuable agricultural raw materials traded on global markets. In 2014, global coffee trading reached USD 31.7 billion. Most coffee is grown in subtropical developing countries, and processed and consumed in industrialized countries. Coffee is grown mainly in South America, sub-Saharan Africa and Asia. International Coffee Organization estimates that coffee is grown in more than 50 countries around the world, its sales reach the highest turnover in world trade after crude oil. In some African

countries, such as Ethiopia, Uganda and Rwanda, coffee accounts for 54% of foreign exchange income. Currently, Vietnam is the second largest exporter after Brazil and has an estimated market share of 13%. According to the geographical breakdown, the main coffee producers in the world in 2016 include: Brazil, Vietnam, Colombia, Indonesia, India and Ethiopia. Further positions in recent years have been respectively Honduras, Mexico, Uganda and Guatemala. Among the largest producers only in Brazil and Vietnam managed to significantly improve production in the period 2000-2013. The leader in the export of coffee beans is Brazil. Its exports increased to over USD 6 million in 2016. Vietnam came second (USD 2.9 million) and overtook Colombia, which exports USD 2.5 million. These three producer countries have achieved 36% of world exports of coffee beans. Among the largest coffee exporters are European countries. In fourth place among the largest exporters in terms of value were Germany, as well as Switzerland. The most important coffee bean importers include the United States (5.8 million USD), Germany (4 million USD) and France (2.6 million USD). Other major importers include Italy, Japan, Canada and the Netherlands. However, the first three of these countries represent 40% of the world's coffee imports. This confirms the thesis that the main centers of consumption and processing of coffee beans are found in rich industrialized countries. International trade in coffee beans is dominated by a group of several international corporations. Most of them supply up to 75% of their national markets. Such entities include: Neumann Kaffe (Germany), Volcafe (Switzerland), Cargill (USA), Esteve (Brazil/Switzerland), Aron (USA), ED & F Man (Great Britain), Dreyfus (France), Mitsubishi (Japan). A particularly strong position on the wholesale market is also played by large food concerns, such as Nestlé, Kraft Foods, Folgers (Procter & Gamble) and Sara Lee (Farmer Bros. Co), which have their own supply chains covering the entire path of the coffee supply chain, i.e. from plantation to consumption [74-76].

Two types of khat trade appeared in the European Union – besides the legal distribution network, the black market has been operating for decades. Profits from it are estimated at billions of dollars, but accurate data is difficult. Kassim et al. conducted a detailed financial analysis of the sale of khat in London, before the entry of the law banning the use of drugs [74]. The results of this analysis carried out in 5 Khat sale premises in London, four of which were supplied with goods from Somalia and one – from Yemen and were located close to each other and religious institutions [mosque] and shops, markets or restaurants. Sellers referred to their premises as “social centers” that differed in type from small living quarters with small seating and large warehouses. Each place provided a room where male customers could meet and consume khat. These premises advertised using oral communication. The average time that each khat vendor worked ranged from 1 to 15 years. The number of khat packages sold varies depending on the seller. Only one khat vendor sold both Miraa and Harari khat. None of the premises offered dried khat leaves or powder. The sellers claimed that they imposed an age limit that prohibits children from buying khat. They also demanded that customers smoke the khat outside, not in the premises. Harari khat was exhibited in refrigerators to preserve the freshness of the leaves, and the khat Miraa was placed in cartons. The most common ethnic group among customers were Somalis, followed by Yemenis and Kazakhs. The clients of the

premises were adults aged 18 to 65. Men constituted the majority of clients in all branches. However, four sellers said they also have several female clients. Under the pretext that there are religious bans against the mixing of the public sex, these women cannot sit and chew with men. The clients could not enter the premises, and the transactions were made off the premises or by delivery. The sale of Miraa was the highest on Fridays, usually after prayers, and then on Sundays when fresh supplies were being delivered. Most of the trade took place in the afternoon and evening. None of the premises used the Internet to book and sell khat. Only one seller regularly accepted phone reservations on khat. The origin of the varieties ‘Aweday’ and ‘Abo Mizmar’ Harari khat was from Ethiopia. ‘Aweday’ was the most popular ‘Harari’ variety sold in packs of 200 g, 400 G and 1 kg for 5-20 pounds. Miraa appeared in various varieties (‘Lara’, ‘Giza’, ‘Asli’, ‘Alele’, ‘Kangeta’) and was only sold in pre-packed packaging weighing about 250 g for 3 pounds. Payments were made in cash, and most sellers offered “later programs” or informal loans. These enabled customers to pay when they were able to, or they could set up a monthly account. Water and non-alcoholic beverages were often bought together with khat. Three salespeople have limited the sales of Miraa to 4-5 packages per person. Two sellers said their customers could buy an unlimited amount of khat [77-78].

Khat is grown on the Arabian Peninsula and in the areas of fallen and failing states. Recent events - the civil war in Yemen, as well as the influx of migrants from the Black Continent to Europe – increases the importance of African exporters. The khat import ban introduced by the UK last year shook up economics in East Africa. Before the entry into force of rigorous regulations, about 60 tons of khat was exported to the British Isles and the Netherlands every week. Within months, hundreds of thousands of farmers, trade intermediaries, suppliers from Kenya, Ethiopia and Somalia, where khat is legal, have lost their livelihoods. Switching to other crops is not easy, especially in traditional communities that have dealt with the catastrophe for generations. Profits per hectare of coffee plantations are much smaller than those generated from the sale of khat. It is this khat that is more resistant to drought, does not require such care as coffee. Negative effects of the introduction are also emphasized by ecologists. The cultivation of khat is important for stopping the process of soil erosion. Africans, who used to be cultivated in khat, are increasingly looking for profits in exporting timber. A deforestation of forests accelerates the desertification of huge earth surfaces, and this generates a new type of tension and conflict, e.g. for access to water [77-79].

Cocaine is the most commonly used illicit stimulant in Europe. The value of the cocaine market is estimated at least 5.7 billion euros annually (4.5-7.0 billion euros). Cocaine goes mainly to the countries of Western and Southern Europe, and its consumption in recent years has been quite stable. Cocaine goes to Europe mainly from Colombia, Brazil and Venezuela, from where it is transported by sea and by air. Important transit areas are the Caribbean and West Africa, and more recently Central America. The methods used to conceal this substance are constantly changing: cocaine is transported, for example, as a component of “carrier materials” (e.g. plastics), and then subjected to chemical extraction in Europe. The wholesale supply of cocaine to Europe is dominated by Colombian and Italian criminal groups, working in cooperation

with other groups (e.g. Dutch, British, or Spanish). Groups from West Africa, especially in Nigeria, are also actively involved in the transport of cocaine from Africa to Europe; the position of ZGP from the Balkans is also strengthening. The value of the cocaine market is estimated at over EUR 6 billion and it is the most frequently used illegal substance in Europe, a stimulant, although high consumption rates concern several countries of western and southern Europe. In Europe, cocaine is available in two forms: as a powder (hydrochloride) and less often, in a form adapted for smoking (crack). In several countries there are small populations of highly marginalized crack users. Cocaine can also receive, also by injection, drug addicts. Cocaine demand indicators are generally stable, or indicate a slight decline in cocaine consumption from the peak period of popularity. The latest data suggests a possible increase in the availability of cocaine: retail prices have remained stable or falling, and the purity of cocaine sold on the retail market has returned to its level from 10 years ago, although it still does not exceed 50%. It is difficult to interpret these trends due to insufficient knowledge about the way the cocaine supply chain works. The main precursor used in the production of cocaine is potassium permanganate. The majority of potassium permanganate seizures take place in South America, which is probably related to the illegal production of this compound using potassium manganate. Therefore, the measures taken to prevent the illegal use of potassium permanganate produced by legally operating producers have proven to be effective. Efforts should therefore be continued to prevent the illegal extraction of this substance from legal sources. Trails and methods of smuggling. Cocaine is smuggled from South America to Europe, both by air and by sea, from major ports in Brazil, in Ecuador and Venezuela, which are key shipping points for large shipments. Cocaine is increasingly being shipped from Brazil, which should be interpreted as evidence of the growing importance of Bolivia and Peru as cocaine producers supplied to Europe. Also, the Caribbean and Continental countries of West Africa, as well as nearby territories, such as Cape Verde and the Canary Islands, are important transit areas for cocaine, although the importance of Central America is growing. The main smuggling nodes are the Caribbean, Dominican Republic and Jamaica [4, 76].

The cannabis market accounts for about 38% of the retail drug market worth more than EUR 9.3 billion annually (from EUR 8.4 to 12.9 billion). It is estimated that around 22 million EU citizens have been in contact with cannabis over the past year, and around 1% of adult Europeans reach for it almost every day, which increases the risk of health and social problems. ZGP are very much involved in production and trade, using technological innovations to produce more and more products with strong performance. The European market is dominated by marijuana grown in EU countries, while the shish from Morocco is an ever-stronger substance that can be smuggled into the EU along with other illegal goods. The deteriorating situation and instability in the countries of North Africa and the Middle East are not without influence on this phenomenon. Increased production and technical innovations in the EU market for cannabis over the past 10 years have led to changes in this market: in many countries the production of cannabis is increasing, displacing imported hashish. Nevertheless, large quantities of hashish are still being imported, and marijuana goes to the EU from many other countries, including from Africa. Recently, cannabinoids [CBD] are gaining more

and more popularity in the pharmaceutical industry and dietary supplements. CBD can be easily extracted from flowers and leaves of industrial hemp as a valuable by-product. In 2013, over 240 tons of flowers and leaves for medical applications (THC/CBD), dietary supplements (CBD) and the production of essential oils (for food and beverages) were produced, compared to 7.5 tons in 2010. This means an increase of 3 000% since 2010. In the following years a further increase in the production of medical applications is expected [79].

The heroin market is the second largest drug market in the EU. Its value is estimated at 6.0 to 7.8 billion euros and it is responsible for a significant proportion of deaths among drug users and also causes huge social losses. After a period of relative decline in supply, signs of increasing availability of this substance have recently been observed, which can be seen as a harbinger of greater damage related to it. Large amounts of opium are still produced in Afghanistan. Production techniques, locations, trade routes are becoming more and more flexible and dynamic, as evidenced by the growing number of seizures of large amounts of heroin. More than ever, heroin is transported in containers transported by sea, and new routes run through Africa, the South Caucasus, Syria and Iraq. The main corridor to which heroin goes to the EU, however, remains the Balkan route. There are also signs of market diversification related to the growing popularity of prescription drugs and new synthetic opioids [80-86].

Tobacco. Thanks to the considerable popularity of this stimulant there is a constant increase in the range of its cultivation. About 40% of world production is produced in China [around 2,400 thousand tons a year). Other important tobacco producers are the United States (over 600,000 tons per year), India (over 550,000 tons per year), Brazil (around 500,000 tons per year), Turkey (over 210,000 tons per year) as well as Greece, but tobacco is grown all over the world, except in the arctic regions. The key sellers in the tobacco market are: Altria Group, British American Tobacco; Imperial Brands; Japan Tobacco; PHILIP MORRIS; Swedish. A new product appeared on the market: smokeless tobacco. This is a tobacco variant that is not smoked or smoked and is used as chewing tobacco or humid snuff or inhaled through the nose as a dry snuff. Smokeless tobacco, however, contains nicotine and many harmful and carcinogenic chemicals. The tobacco industry is global. There are 6 global corporations and 40 smaller companies or state monopolies operating on the global market. Worldwide annual production of cigarettes is 6 trillion. In 2012, tobacco products were smoked by 967 million people over the age of 15: 31% of men and 6% of women. Most smokers live in poor and developing countries [75]. On average, in 2014, 19.4% of residents, 21.9% of men and 15.1% of women were smoking in the EU-28 [76].

Changes observed on the tobacco market in the old EU Member States, taking place under the influence of decoupling, are associated with a significant reduction in tobacco cultivation and a strong concentration and modernization of the tobacco industry. Tobacco processing in the EU is heavily dependent on imported raw materials and export-oriented tobacco products. The high import of raw materials results from the industry's demand for specific tobacco traits, which are not achieved in Central and Northern Europe. The export of tobacco plays an important role

in the balance of foreign trade, in many European countries. In 2016, the value of exports of tobacco products accounted for 8% of the value of exports of agri-food products. On the other hand, there is a downward trend in consumption of tobacco products, which results from the increase in prices (mainly due to high tax share), the introduction of restrictive smoking bans and growing pro-health awareness [76].

### **Environmental, Social, Economic and Political Associations of Stimulants on the Example of Khat, Hemp and Tobacco**

The habit of chewing fresh leaves and khat twigs (*Catha edulis*) to stimulate their amphetamine-like effects is very widespread in East Africa and the southwest, the Arabian Peninsula [78]. Khat is spoken in Ethiopia, Kenya, Sudan, Somalia, Djibouti, Tanzania, Rwanda, Burundi, Uganda, Zambia, South Africa, Zimbabwe, Saudi Arabia, Afghanistan, Yemen, Israel, India, Pakistan, Turkestan, Iran, Malaysia, and Australia. in Madagascar. Khat is a natural stimulant from *Catha edulis* cultivated in the Republic of Yemen and most countries of East Africa. Its young buds and delicate leaves are chewed to reach a state of euphoria and stimulation [79, 80]. The users of Khat experience a sense of increased energy, increased alertness and ability to concentrate, improve self-esteem and increase libido. However, there are many potential adverse effects of habitual use of khat on psychological physical traits and social well-being [81]. Some people experience anxiety, tension, hypnagogic hallucinations, hypomania and aggressive behavior or psychosis after taking khat [82-87]. Chronic khat eating can lead to mental retardation, possibly contributing to personality disorders and mental deterioration [88]. Khat leaves have a vasoconstrictive factor that can lead to elevated blood pressure: they cause an increase in heart rate and an increased incidence may cause acute myocardial infarction (AMI). In turn, gastrointestinal risks include constipation, stomatitis, oesophagitis and gastritis [89]. There is also a significant correlation between khat chewing habits and hemorrhoid's development. In addition to health damage, khat has negative socio-economic consequences as it affects many other aspects of life, including loss of arable land and working time. With the increase in evidence of the harmful effect of khat on the general state of health and related social problems with its use, the prevalence of khat among the population and associated risk factors. The prevalence of khat usage varies, depending on age, gender, place of residence and occupation [90]. A survey conducted in the Ethiopian rural community showed that the prevalence of current khat use was around 50% [91, 92]. A study conducted in cities in south-west Uganda confirmed that [93] the use of khat was the highest among law enforcement officers (97.1%), then among carriers [68.8%] and students (9.2%). Most khat chewers were used in the 16-25 age range. The high school and the age of higher education (15-25 years) are a very critical period of life in which people try new attitudes and behaviors. Young people are looking for the possibility of their own identity and values [94]. Young people, because of the freedom to experiment, often take risks at this stage, which is associated with negative consequences: car accidents can occur while driving, smoking can lead to cancer, unprotected sex can lead to unwanted pregnancies and many illnesses, including HIV infection, and other health threats, ranging from physiological to social [95]. Khat is used among school students. It was shown that in Ethiopia, 26.8% of student's chew khat [96]. Other studies showed that khat chewing among students

in southwestern Ethiopia was more widespread and amounted to 64.9%. The prevalence of khat usage among medical students and paramedical professions in Northwest Ethiopia constituted 22.3% of all respondents. Milaat et al. report that the prevalence of khat among the general population in the Jazan area is 48.7%; with 45.7% per cent of students of rural origin, and 61.7% - with students of urban origin [97, 98]. Milaat et al., as well as Kassim [97] & Abate et [20]. believe that without understanding the [31] dynamics of the khat market, there is little chance that both the health and social needs of vulnerable social groups will still be without an address. Khat is spoken in Ethiopia, Kenya, Sudan, Somalia, Djibouti, Tanzania, Rwanda, Burundi, Uganda, Zambia, South Africa, Zimbabwe, Saudi Arabia, Afghanistan, Yemen, Israel, India, Pakistan, Turkestan, Iran, Malaysia, and Australia. in Madagascar.

### **Risk Assessment of Potential Harmfulness Pesticide Use in Khat Cultivation:**

Sellers generally did not know the potential threat of khat from pesticides. None of the premises gave any warnings on the packaging about the potential risks associated with the use of khat. The sellers argued that the main benefit of using khat, apart from relaxation, are social interactions, because it is in these premises that they inform users about new products and help them, especially those with limited skills in English, to fill out various forms or other documents. However, excessive use of khat was associated primarily with laziness, family stress and financial burden, as well as with the simultaneous use of other drugs [e.g. alcohol]. The community should be informed about potential damage related to the use of khat. Anderson and Carrier believed there was no evidence between Khat use and social harm [99]. Recent research, however, has revealed that Khat does affect not only on human health, but also has an impact on social cohesion [100, 101]. Khat consumption is high especially in Muslim communities and is usually done at home or in recreational areas. Most people chew on Khat in groups at special religious ceremonies [102].

The psychological experts warn against the toxic effects of the *Catha edulis* on the human nervous system. Khat is a drug, a substance that stimulates, adds adrenaline and gently excites. It also causes pupil dilation, elevation of heart rate and blood pressure, and even hallucinations. Those who abuse khat cannot do without it after 4 days, so they must repeat the process of smoking, brewing or chewing fresh leaves. Khat is a dangerous substance and affects the human nervous system, causing its gradual dependence and demanding next doses, ravaging the entire body. After about 2 hours the effects of khat cease and you have to take the next dose. In this phase anxiety, melancholy and irritability appear. Taking this drug can also cause drowsiness and psychosis. In addition, it irritates the stomach, which leads to diarrhea. This plant has a particularly negative effect on men, causing problems with potential. Khat deeply rooted the roots especially in the Yemen tradition. Today, a common leaf regime means the conclusion of a contract, often also the intake of two families of infusion with *Catha edulis* means consent to marriage. It is estimated that millions of people are already dependent on khat. In Yemen, it is more than 80% of men and 45% of women, while in Somalia about 75% of men and 40% of women chew the cat, which works very much like amphetamine [103]. It affects the nervous system, causes relaxation and euphoria.

It is highly addictive, and its use can cause diarrhea, hallucination, disruption of potency and lead to a heart attack. The first mention of this subject dates back to the 11th century, but most of them appeared after the first scientific description of khat by Forskal in 1775. Chewing is associated with the development of chronic liver disease (CLD). The research was carried out on 150 patients in 2015 and 2016 and another trial of 150 adult hospital patients with CLD and 300 adult hospital participants without clinical or laboratory evidence of CLD were included as controls [104]. Khat use was quantified in “khat years”; 1 year khat was defined as the daily use of 200 g fresh khat for 1 year. For this purpose, a logarithmic regression model was used to control interfering factors. It has been proven that there is a significant link between khat chewing and the risk of developing CLD. In men, the risk, with age, alcohol consumption and chronic hepatitis B infection, increased with increasing exposure to khat compared to patients who never took khat. A significant correlation was found between khat chewing and the risk of developing CLD, and in the case of men this relationship was extremely strong and dose-dependent khat. As the prevalence of khat chewing is increasing worldwide, these discoveries have serious consequences for public health. In Western Europe, there are fears that the sale of khat is used to finance terrorism. Last year, Huffington Post UK announced that every aspect of khat, from its cultivation to marshes, where it is sold and chewed, supports a group of terrorists in Somalia. In the United Kingdom, the ban on khat was initiated in order to prevent the country from becoming a center of smuggling khat to other countries where it has been illegal for a long time. According to British Prime Minister Theresa May, “The failure to take decisive action and change the legislative position in the UK on khat could put Great Britain at serious risk of becoming one, regional or illegal country for further trade in this drug.” But the ban in the UK met with protests. All data on drug use indicate that the ban does not eliminate demand, but only forces more khat production [10, 101, 103]. Therefore, the fight against illegal drugs is insufficiently carried out by countries where the cultivation of this stimulus exists, or in countries where they are most often used. The subsidies for the producers of stimulants are higher than the expenditures for antikhat campaigns.

Cannabis is invariably the most commonly used illicit drug in Europe. They are widely available in Europe in two forms, i.e. as marijuana and hashish; in both cases, they are usually smoked together with tobacco, which causes additional negative health effects. Retail prices of hashish and marijuana are now close and typically vary between € 7 and € 12 per gram, the price varies by country. Actually, prices of this raw material have only increased slightly over the last decade, and at the same time the average power associated with the tetrahydrocannabinol [THC] content has almost doubled [36].

Harmfulness of tobacco. It is estimated that tobacco-related diseases are now the cause of every tenth death in the world. No other single, equally deadly agent is known, a virus, a bacterium or a genetic defect that would cause so many illnesses and deaths [104, 105]. Nicotine activity in tobacco products is stimulant and then infectious on connections in the nerve ganglia, and especially on the autonomic nervous system. It also affects the nerve endings and centers of the medulla [central depression]. Death in poisoning occurs as a result of respiratory paralysis [respiratory depression].

Deadly dose from 50 mg, which corresponds to 2-3 cigarettes taken orally. Symptoms of poisoning: nausea, salivation, vomiting, limb tremors, skin pale, sweating, diarrhea, intestinal colic, convulsions or muscle spasms, visual disturbances, initially slow down, then acceleration of the pulse, disturbances of consciousness, then loss of consciousness, collapse, respiratory paralysis. Nicotine acts on the human body in many different ways, because it binds permanently and blocks the action of dozens of different types of enzymes: in small doses it has a stimulating effect (3 mg), causing increased secretion of adrenaline which causes: loss of pain and hunger, accelerated heartbeat, enlarged pupils, etc. In higher doses it causes permanent blocking of the nervous system, because it is permanently connected with the so-called nicotinic receptors in nerve cells, disrupting their metabolism. Nicotine also works anticoagulant. If you smoke a cigarette, nicotine works almost immediately after taking (about 7 seconds), but it stays in the body for a very long time (half-life is 72 hours). Is a highly addictive substance. Nicotine is physically addictive. However, the doses consumed by smoking are minimal, as most of the nicotine present in cigarettes is burnt, but they are sufficient for quick addiction. Nicotine also works on the amount of dopamine in the brain. People smoke to maintain high levels of dopamine in the brain. Nicotine is a weak MAO inhibitor. Most people with schizophrenia (75-90%) smoke cigarettes. This probably results from subconscious guesses about its healing properties [105-107].

Smoking is one of the most serious modern civilization threats. This is due to the spread of this phenomenon, as well as losses incurred for this reason by society and the world economy. Currently, there are around 1.2 billion people around the world, or 1/3 of the population over the age of fifteen. It is estimated that about six trillion pieces of cigarettes are smoked annually. About 80% of smokers live in developing countries, of which 360 million in China. China is currently the largest producer of cigarettes in the world, and tobacco consumption in this country is systematically increasing by about 3% annually [106, 107]. Despite the efforts to reduce the addiction, the number of smokers continues to increase, mainly in developing countries, especially in low- and middle-income households in the household. The forecasts for the next decades are also pessimistic. It is believed that the health, economic and social effects of smoking will be even more intense in the next 15 years [108, 109]. It is estimated that by 2025 the number of smokers in the world will be about 1.6 billion.

The exposure of human fetus to the influence of tobacco smoke particles turned out to be a very important and at the same time dramatic phenomenon. According to the WHO European Center, about one hundred thousand children are born in Poland every year, exposed to the components of tobacco smoke during fetal life due to active smoking by pregnant women. Of the remaining pool of pregnant women, the half who is not active smokers, is exposed to passive smoke inhalation. The effect of exposure to inhalation of cigarette smoke for an emerging fetus is slowing its growth, underdevelopment of some organs (e.g. respiratory system), reduced immunity, higher incidence of pneumonia, increased occurrence of bronchial asthma, as well as postnatal symptoms of nicotine craving, increased nicotine tolerance and ease addiction to nicotine in the future [110].

During the production process cigarettes undergo very complex

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chemical processing. The tobacco is added preserving substances, improving the taste or affecting the quality of the product. As a result, when deciding to smoke a cigarette, know that along with tobacco smoke is absorbed 7 thousand harmful substances, of which over 70 are carcinogenic. Of the commonly known poisons besides nicotine, tobacco smoke contains: acetone, hydrogen cyanide, cadmium, arsenic, ammonia, carbon monoxide, methanol, DDT, toluene, butane, etc. The harmful effects of tobacco smoke are not limited to the respiratory system. Toxic substances absorbed into the bloodstream are distributed throughout the body and have a detrimental effect on all of its functions. Studies have shown that tobacco smoke irritates the mucosa of the nose and mouth, esophagus and stomach, also leading to its damage, has allergic properties, has toxic effects on the respiratory, cardiovascular and nervous systems, as well as on all other organs and tissues [including pancreas, kidneys and bladder]. In addition, it can lead to mutagenic, teratogenic and carcinogenic cell changes. Psychoneurological studies have indicated strong psychoactive, including the addictive effect of nicotine. Among the health problems causally related to smoking, cancer, cardiovascular diseases, respiratory diseases and others are mentioned. Addiction to tobacco worsens the quality of life, causing diseases such as:

- respiratory system (asthma, emphysema, chronic obstructive pulmonary disease, COPD, bronchitis and lungs);
- cardiovascular system (coronary heart disease, myocardial infarction, atherosclerosis, hypertension, thromboembolic diseases including stroke, Búrgera's disease, aortic aneurysm);
- cancerous (there is a causal relationship between smoking and numerous malignancies, including lung, larynx, throat, esophagus, mouth, nose, lip, pelvis, bladder, pancreas, stomach, liver);
- gastrointestinal tract (gastric ulcer, duodenal ulcer);
- disturbs the redox balance modulating the course of intracellular reactions and causes an unfavorable effect on the environment of the developing fetus;
- other: osteoporosis, susceptibility to colds, allergies [111-112].

Three large disease groups occur almost exclusively in cigarette smokers – it is lung cancer, chronic obstructive pulmonary disease (COPD) and myocardial infarction before age 50. It is estimated that 5 million people die prematurely from smoking in the world, and this number is constantly growing. The expected life expectancy of smokers is about 10 years shorter than in non-smokers. Regardless of age and the number of years of smoking, stopping tobacco use brings measurable health benefits! Quitting smoking before the age of 40 reduces the risk of death from tobacco related diseases by about 90%, but even the discontinuation of cigarettes at a later age means that the risk of tobacco-related diseases decreases continuously with the passage of time from smoking cessation. view of public health. Studies have shown that tobacco smoke irritates the mucosa of the nose and mouth, esophagus and stomach, also leading to its damage, has allergic properties, has toxic effects on the respiratory, cardiovascular and nervous systems, as well as on all other organs and tissues (including pancreas, kidneys and bladder). In addition, it can lead to mutagenic, teratogenic and carcinogenic cell changes. Psychoneurological studies have indicated strong psychoactive, including the addictive effect of

nicotine. The expected life expectancy of smokers is about 10 years shorter than in non-smokers.

Regardless of age and the number of years of smoking, stopping tobacco use brings measurable health benefits! Quitting smoking before the age of 40 reduces the risk of death from tobacco related diseases by about 90%, but even the discontinuation of cigarettes at a later age means that the risk of tobacco-related diseases decreases continuously with the passage of time from smoking cessation. Studies have shown that tobacco smoke irritates the mucosa of the nose and mouth, esophagus and stomach, also leading to its damage, has allergic properties, has toxic effects on the respiratory, cardiovascular and nervous systems, as well as on all other organs and tissues [including pancreas, kidneys and bladder]. In addition, it can lead to mutagenic, teratogenic and carcinogenic cell changes. Psychoneurological studies have indicated strong psychoactive, including the addictive effect of nicotine. Smoking alone is the cause of almost 4 million deaths annually in the world. This means that due to the so-called tobacco-related diseases dies 11,000 per day smokers. These diseases are the cause of death in every second smoker aged 35-69. Each cigarette shortens life by an average of 5.5 minutes. Smoking is the largest, preventable, deadly threat to global health. It is the cause of more deaths than AIDS, alcoholism, car accidents, drugs, fires, homicides and suicides combined. Smoking is one of the priorities in the health policy guidelines of the governments of many countries in the world [109, 111].

Another problem is the new synthetic psychoactive substances registered on the market. EU Member States have one year to adopt appropriate control measures for new fentanyl in their national legislation. According to the EMCDDA report, in 2019, 66 new psychoactive substances were detected for the first time through the European Early Warning System. Currently, the EMCDDA system monitors over 620 new psychoactive substances, which is twice as much as in 2013. This number includes 24 new fentanyl's – very strong opioids. Contact with the smallest amount of fentanyl can cause poisoning, which is a threat to life, which affects the increase in deaths as a result of their consumption (e.g. only in the result of taking alfentanil in 2016 60 people died in Europe).

Support for counteracting NSP may be the new EU regulations of November 2017, in the form of strengthening the European Early Warning System [EWS] and the faster course of the risk assessment process [69]. This is due to the European Commission's proposals, such as the Regulation on the exchange of information on new psychoactive substances and the early warning system and the risk assessment procedures for these substances and the directive extending the definition of the drug to new psychoactive substances. The new regulations retain the current three-step procedure for responding to new psychoactive substances, which consists of: a) early warning, b) risk assessment, c) control activities, and at the same time significantly strengthen existing procedures by improving and speeding up the data collection and evaluation processes. The new procedure allows for the introduction of shorter deadlines for the implementation of individual stages of activities leading to the disposal of substances in the EU. The EMCDDA will continue to play a leading role in the monitoring of new psychoactive substances reported by the member countries of the community as part of the early warning system. Within

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two weeks of the EMCDDA submitting a preliminary report, the European Commission will be able to ask you to assess, within no more than six weeks, whether there are risks associated with a specific substance. Based on the risk assessment, the Commission proposes a formal decision on taking control of the substance.

### Summary

Kassim et al. was the first to explain the aspects of khat markets, including availability, affordability and promotion of khat “paying in later programs” in only one specific area [London Borough of Tower Hamlets in Great Britain]. Khat was available in places called ‘mafrishes’, often referred to as “Somali pubs”, which were cafeteria-type premises, mainly for Somali communities. They were part of cafes or restaurants as independent places to buy and consume khat. They were especially recognized by khat users as places meetings of the local community. Such khat sales premises may focus on any local area, close to local amenities [churches, shops] [111]. The profile of availability of khat for local consumers apparently was not different from other strong stimulants, such as cocaine, it turns out that its access is related to the ethnic and socio-demographic composition of the area, area. The predominant sale of Miraa over other types of khat reflects the demographic composition of the district; most of the customers were Somalis, hence they chose Miraa khat most often because it was cheaper and its effect was stronger, thanks to which users became chattier and more confident [112]. Availability of Khat, compared to reports from previous studies, increased thus reflecting the increase in demand and changes in the use patterns of stimulants. Sellers gave a range of prices and packages to meet the needs of different users. According to the latest literature, the use of khat has been noted, among people without financial means, through the possibility of a “later payment” and credit. In addition, despite the fact that the sellers were selling for many years, they did not observe any increase in sales in terms of additional customers or larger amounts per customer, except for accidental sales opportunities, such as during the Muslim Eid. It is also the result of the increase in the number of competitive khat outlets available elsewhere. Kassim’s research was the first of its kind to estimate the profit from the sale of khat. With regard to these data, the cigarette, butts rejected outside the establishment were “no” health and safety measures. They are an indicator of the growing awareness of the risk of smoking in enclosed spaces and activities undertaken by ‘mafrishes’; to reduce the negative impact on health and the inconvenience of smoke. ACMD forbade the sale of children to khat, but it is difficult to verify if this ban was observed. In terms of risk assessment and public health, penalties were never imposed, even if khat was a legal commodity. 90 percent of the sellers did not know where the khat came from and whether it was grown organically or treated with pesticides or fertilizers. However, khat sellers have reported one of the risks of using khat: mixing it with other drugs [alcohol], which is consistent with other studies. In addition, no indications for consumers or warnings about the potential consequences of using khat have been observed. It was sold in packages wrapped in a banana list without information about the quality, content, variety and source, it is possible that khat survives the risk or reduces the risk. Some sellers have reported limits on the number of khat packages that a customer could buy, but they did not advertise the risks associated

with overconsumption. Sellers also reported the sale of other goods [water and non-alcoholic beverages] next to khat. Finally, feedback from sellers about the benefits and problems associated with khat chewing was in line with existing literature.

In many European countries since the 1970s and 1980s there have been significant markets for cannabis, heroin and amphetamines. Over time, other substances have also gained market position, including MDMA and cocaine in the 1990s. The European drug market is still developing, and many new psychoactive substances have appeared in the last decade. The nature of the illicit substance market has also changed as a result of globalization and the emergence of new technologies, including innovation in drug production and production methods. It creates a serious threat to the health of society.

In the case of tobacco products, most countries in the world have legal regulations regarding the sale of cigarette and other products. For example, according to the law in force in the European Union, the sale of tobacco products [cigarettes] to young people under the age of 18 is prohibited. The sale of cigarettes to minors is forbidden and threatens to pay fines [113]. In addition, there is an obligation on manufacturers to put a sign on the packaging on the potential health effects of smoking. It is forbidden to sell cigarettes in packs containing less than 20 pieces, cigarettes without packaging and on art. It is also illegal to trade cigarettes containing marijuana or other intoxicating substances. The provisions on advertising and promotion of tobacco products have also been tightened [113].

The globalized supply chains of goods make it possible to place orders for wholesale quantities of new psychoactive substances [NSP] online. They are transported to Europe and other continents, there on the spot packed and sold in the free or black market. This market attracts various well-organized criminal groups due to low risk and potentially huge profits. In addition, many new psychoactive substances are sold openly as “legal” drug substitutes. There have been no signs of any slowdown in this aspect. Only in 2015, as many as 100 new substances were notified, and the EU early warning system is currently monitored by more than 560 NSP. The substances available on the market reach both young people who take them occasionally, as well as representatives of marginalized groups of people taking strong drugs. Manufacturers, in turn, try to bypass legal and regulatory restrictions by developing new substances. There are indications that these substances are also produced in Europe. There were also separate, but cooperating, markets for “legal highs”, “research substances” and “dietary supplements” sold in stationary and online stores. With the increase in availability, there are more and more cases of very acute, sometimes even fatal poisoning and cases related to injection of cathinone’s by injection.

### Conclusions

1. The political authorities in a given country decide about introducing new drug plantations. Increasing the area of their crops provides developing countries with independence from the fluctuations of world markets and thus causes greater economic stabilization.
2. Natural resources of plant raw materials could provide a solid

basis for clinical research on nutritional, phototherapeutic and pharmacological metabolites, e.g. coca, and could help create new tools to address urgent health problems such as stimulant addiction, depression, obesity and malnutrition. Moreover, these innovations could reinforce any arguments in favor of establishing legal markets for controlled plants such as *E. coca* and *E. novogranatense*. This can ultimately help reduce the illicit drug trafficking and its negative impacts, while providing legal economic opportunities for human populations who continue to suffer from the effects of both illegal markets and harmful drug policies.

3. Developing countries have the largest share in the profits from the sale of stimulants, as usually areas of stimulant consumption overlap with areas of malnutrition.
4. Among the drugs analyzed, khat, tobacco, coca and areca nuts currently have the greatest impact on the social, economic, medical and psychological aspects related to its use. At the level of the khat family, it can be very harmful to their budgets, especially among the poor.
5. The fight against illegal drugs is insufficiently carried out by countries where they are cultivated, or in countries where they are most often used. The subsidies for producers of stimulants are higher than the expenditures for anti-smoking or anti-life campaigns.
6. Without a better understanding of the dynamics of the drugs market, there is a risk that both the health and social needs of vulnerable social groups will continue to be affected. Future research should track changes in the currently illegal drugs market to assess the social situation and impact on public health in society.

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