Chapter 1

Introductory Chapter: Overview on Grass Topic

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1. Introduction

A regulate analysis of the connotation of the word "environment" in the sustainability explains clear circumstances of a being or thing (social, economic, and physical). Moreover, the meaning covers the systematization of the environment upon the physical process. The environment in a broad sense also contains all the natural and artificial factors of the physical, chemical, biological, and social nature in which a human being is a factor motor of community that develops. The importance of maintaining a steady state, the human relationship, and its living environment requires an ability to control the environment in an optimal arrangement of ecological balance. For creating a competent urban zoning, it is necessary to state that green areas in general and grass in special require a delimitation based on a unitary structure of territory structure organized. It has to be created by successive stages (valuable parts), which in the functional aspect consists of areas characteristic of the dominant aspect, the weight of one of the functions, or a greater diversity of the functions, mono-functional multifunctional space [1]. Grasses in the planted area (as a functional urban area) are shaped to serve the specific areas for beauty or recreational purpose. The grasslands have an esthetic function, which can be presented by

- An essential element to highlight architectural objects
- A significant decorative value (by shape or color)

The grasses are the most valuable horizontal green plan. The family itself is the source of the grains that are the stuff of life for most of the humankind. The beauty of grasses is quite different from another planting area [2]. The simplest definition of "the grassland" represents an area of land covered by herbaceous vegetation, consisting mainly of grasses, which is subject to care work and is designed to perform certain decorative, recreational, or sanitary functions. The lawn is the main fund of green space (75–80% of the area; rocks, shrubs, floral arrangements, and massive trees) or naevi (rocks, statuary groups, architectural

elements, buildings, and water Lucius), uniting the diversity of the green space. The turf is an item of exceptional decorative value, imparting an atmosphere of calm and tranquility; due to the green tones, the vast stretches of lawn introduce into the landscape a note of solemnity and romanticism. Air temperature is influenced by lawn surfaces; on high-temperature days, the lawn heats less compared to coated surfaces with sand, gravel, brick, asphalt, or concrete. For example, if the average air temperature from the lawn surface is 22–24°C, then the surface temperature of the concrete surface is 30°C, and in the case of asphalt, it is approx. 45°C. Sanitary qualities also consist of air purification by retaining dust and oxygen enrichment. According to destination, composition, and maintenance, several uses of grasses are distinguished:

- For lawns
- For sports grounds
- Rustic

The grass family (Poaceae) is a plant family in the grassland. With about 11,000 species in more than 650 types, it is one of the largest families of the flower plants. It is widespread in all the world's climate zones. Many species of grasses belong to the oldest useful plants and have been of vital importance to human beings since the dawn of the day [2]. All cereals, such as wheat, rye, barley, oats, millet, maize, and rice, are included in this plant group. Landscape forms such as meadows, exuberances, steppes, and savannas characterize vast areas of the world's landscapes. Although the different species in the grass family in many ways resemble each other, there is a great variety. This kind of grasses is no wonder because they are among the plant groups that can easily adapt. They grow in polar regions and deserts, in tropical rainforests, and on windy slopes of mountains. Whole vegetation areas, such as steppe, llanos, prairie, and savannah, are dominated by grass. Most grasses also have the advantage that the stem if bowed by the wind or threaded can rise by firing faster on the side facing the ground. Grasses occur throughout the world and in almost all vegetation types. There are single or perennial plants with hollow stems (straw), which are however compact and often swollen by the leaf feathers (knees). The leaves are more or less ribbon shaped and form a staggered leaf sheath in the lower part. A piggy bank is made up of toroidal, dandelion-shaped leaves (after) and contains one or more flower without a true blister. In many grassy areas, natural fires play a crucial role. Lightning ignites, at the end of the growth period, the dead plant material. The inorganic nutrients in the ash promote the new growth of plants as fertilizers. Also, tree growth is destroyed. The fires thus contribute to keeping the grassland open. Grazing areas inhabit and nurture an ancient and diverse animal world of insects (termites and ants), spiders, birds, small mammals, and not least grazing flocks of large mammals as on the African savannas. Some grasses are sparsely built and are only a few centimeters broad. One- and two-year species usually have single or few shoots in loose leaves with soft leaves. In these grasses, all or most stems bear inflorescences. In most cases, the long-lived species form firmer straw and longer leaves and form a larger or smaller number of nonflowering shoots in addition to flowering shoots. They grow in loose or dense gardens or lawns. The recent growth form occurs when the plants propagate with more or less long overground, creeping, greenish, or reddish stalks, called pricks or using subterranean,

white, or brown rhizomes. In addition to the color, the two types also distinguish between the knees on the runners with roots: stools have full leaves on each knee, whereas rhizomes in these places have only small, thin skeletal low leaves. In this way, due to the closely compacted shoots, the typical tube-shaped growth form of many kinds of grass occurs. Most grasses have wood nuts. They do not form a principal or pedestal. At the root of the stem and the knees of the outriggers, many roots are formed, each of which can develop leaflets of first and second order. In this way, root systems with a considerable size can occur. Thus, a single plant of Red Swing may spread 250 m in diameter. The grass is the largest family of flowering plants, and of all vegetative families, it is the most appreciated to human beings. It has an extensive range of uses. However, it is only about relatively few genera that are important as useful plants for humans. Only about 15 genera (it is barely 2%, although bamboo genera are not included) play a bigger role. It is a generic term for Gramineae monocotyledonous green plants where it is found on the plain, hill, and mountain. At present, about 4500 species of the Gramineae, or true grasses, have been classified. Approximately 1500 of these species are believed to be native to North America. The grasses take on more than a fifth of the earth's plant cover; it is composed of plants of small height and produces seeds and is used as a diet for ruminant animals. Varieties of grasses that grow very often and of low heights are used, under the name of law, to cover the green spaces. Grasses carpet the baby's playpen, blanket the old man's grave, and cover somewhere near a fourth of all the other land on the earth. The known species range in size from the miniature "three lawns," smaller than a shirt pin, to the giant bamboo that towers above medium night forest trees. The progress of the grasses is spotlighting the ancient strongholds of the Gramineae. These include the ancient pastures of Western Europe, the principal river valleys of Eastern Europe, the vast steppes of the Russia, the hard used herd lands of Manchuria and the Mongols, in South African veldt, the deep-soiled pampas of Argentina, the campus of Brazil, the llanos of the Orinoco Basin, and the great savannas of Australia and New Zealand. However, the North American Great Plains, for the most part, west of longitude 98° W, keeps their place as the most productive of all the high grasslands of the earth. Currently, grasses are reappearing and otherwise gaining ground in the tropics, the original homeland of grasses where the greatest number of species in any area is still to be found. Grasses are pushing farther and farther up and down toward the poles, invading tundra, following in the wake of sledge runners and the first ruts made by the wheels of planes, tractors, or the wide-ranging jeep. Grasses keep venturing farther into deserts, higher up mountainsides, and closer to ocean edges, but now, as perhaps through hundreds of centuries, the grasses show their fastest increase in the temperate zones. Grasslands from the largest natural grassy areas on earth in climate zones are not suitable for forests. Also, they create cultural landscapes, especially in Central Europe. They have arisen in a long process after the Ice Age, where forests have been transformed into meadows and pastures.

2. Grasses upon human history

Grasses have lived on the earth a great deal longer than people have. In this way, man has been the fortunate member of the partnership. Through apparently hundreds of centuries,

man followed the grasses to live on the grazing animals and birds, which they sustained. Appropriately, the earth's first ages of grasses came even earlier than the first age of the grazing animal. Indeed, the word "graze" was derived from "grass." Supposedly, during Miocene times, believed to have begun some 30 million years ago, the forebears of grass came out of tropical forests and swamplands onto the cooler and drier lands. The succeeding Pliocene epoch, believed to have ended a million or so years ago, was distinctively an age of grasses and grazers. During its centuries, both grasses and trees tended to lose their gigantism, while animal life acquired some part of the genetic bigness, which vegetation was losing. Mastodons, giant rhinoceroses, and big horses grazed on the far-spread grasslands of the continents. After the Pliocene, the Ice Age began. Gigantic mountains of ice locked in so much of the earth's water that the Bering Strait, the Isthmus of Panama, and other land links previously submerged were changed into open bridges, which permitted ready intercontinental migrations of grazing animals. The masses of ice that advanced and retreated four times in our present time are described as a late phase of the fourth recession. However, ice masses or no, animal life survived and increased, where and as grasses permitted. Buffaloes, elk, antelope, and deer became the main American grazers on the grassy fringes of the ice fields. Africa and lower Asia stayed free of the ice and became refuges for some of the bigger grazing animals. Supposedly after the last great ice sheets at least partially withdrew, Asians came across the Bering Strait and poured down and across what was by then one of the biggest areas of grass on earth, spreading intermittently from what is now upper Canada to the plains and hills of Patagonia. For many centuries, those earlier Americans sought, slaughtered, and lived with animals, which lived on the grasses. Eventually in the Western Hemisphere, as apparently, he had learned even earlier in the Eastern Hemisphere, man began adapting what he deemed the best of the grazing animals to herd livestock. The North United States of America does not lead the world in either the selective breeding of grasses or the production of nutrients per acre of grasses harvested. In both attainments, other countries certainly France, the British Isles, Australia, New Zealand, and quite probably the Netherlands are still ahead of us. Soviet Russia is claiming the world leader in the genetic development of perennial grain grasses, including wheat and rye, that is, Russian plant geneticists are seeking to turn into biennials wheat, rye, and perhaps other annual grains, and eventually to make them (they hope) perennials. However, in the total value of grass harvests, the United States not only leads but also overwhelms.

3. Grass functions and roles

The grasses are not only the most common of the flowering plant families but also the most important, where some of it represent the basis of our food. These include the four bowls of cereal (wheat, barley, rye, and oats), also corn, rice, millet, etc., and grass seeds for bread, porridge, beer, etc. Grass family has been the main source of food for people in almost all cultures since the early start of the drugstore and also an important source as cattle fodder. Grass has many functions, starting from the medical and therapeutic function to leisurely utility. In the following subdivisions, some of the essential functions of grasses will be represented.

3.1. Therapeutic function

Grasses are one of the oldest therapeutic elements and are found in all continents and cultures where plant medicine also covers parts of pharmacology, pharmaceutics, and toxicology. The herbal medicine is partly based on traditional medicine. Experienced values, traditional knowledge, and traditions play a major role. In plant medicine, only whole plants or parts of plants (flowers, leaves, seeds, bark, and roots) are used, but no isolated individual substances are used. The active components of medicinal plants are subject to natural fluctuations caused by the climate, location, and harvesting time of the plant.

3.2. Protecting and improving the environmental function

The environmental protection and improvement functions are multiple, reaping more or less at different green spaces.

1. The hydrological function is the first function, which is provided by all types of green spaces, being expressed by the greater or lesser capacity of precipitation water to be retained, and to the release of either the atmosphere in the form of vapors or the soil through its percolation phenomenon toward the horizons.
2. The ground protection is an important function that is noticeable in areas lacking vegetation or grasses where the erosion processes are visible. Through the system of rooting, which is a biological soil armature, by the phenomenon of attenuation of the mechanical effect of raindrops, exerted by the foliage of the grasses, which is often arranged in several layers, the substrate constituting the support of the vegetation presents a mechanical, physical, and chemical stability, greatly enchancing the prevention of soil erosion and landslides [3].
3. The climate protection is the main function of green elements, which is exercised by all green spaces under different aspects:
    i. Moderation of the amplitudes and thermal variations
    ii. Decreasing the wind speed
    iii. Improving the humidity of the air
    iv. Improving the intensity of solar radiation

The modeling of diurnal and seasonal variations of vegetation is exercised by the shading effect, through the evapotranspiration processes, by the specific albedo, or by the reduction of the wind cooling effect. The direct effect of grasses is evident in our life where a 1.5 m^2 of uncut grass produces enough oxygen per year to supply one person with his or her yearly oxygen intake requirement [2]. Woody vegetation, through its microclimate, moderates excessive temperatures, so temperatures in hot summer days are lower in the masses of trees, protection curtains, stripes planted alongside the streets, or near them, and in winter, temperatures are higher due to the air movement diminishing the effect.

For example, if the air temperature at the surface of the concrete is 30°C, under the same conditions, the surface temperature of the asphalt will be 45°C, and the air temperature at the grass level will be between 22 and 24°C.

3.3. Antipollution function (healthy)

This function is fulfilled by green spaces, regardless of the size or nature of their vegetation, under different aspects:

- Reducing the physical pollution of the atmosphere
- Reducing the chemical contamination of the air
- Reducing noise effectually

The function of the reduction of environmental pollution can be achieved precisely by the ability of the vegetation to retain, fix, and sediment particles suspended in the atmosphere, fine powders, or smoke. Through the foliage and crown texture of different woody species or the texture of the various grassy vegetation areas, by decreasing the air velocity, the vegetation retains substantial amounts of particles, which are subsequently entrained by the water from the precipitations at the ground level [4]. The physical purification capacity depends on the species, the leaf size, the porosity, the life of the leaves, and so on. For example, an ingenious surface retains 3–6 times more dust and particles. Solids than a mud surface and a medium-sized tree retain 10 times more impurities than the surface of its crown projection covered with lawn. One hectare of oak forest can hold 68 tons of solid particles and dust, for spruce approx. 30 t/ha, silvery pine approx. 35 t/ha, and lime lump approx. 42 t/ha. The reduction of chemical pollution is achieved by green spaces primarily by CO_2 consumption and O_2 produced by the actual fixing of toxic gases resulting from various activities: fuel combustion, chemical industry, metallurgy, oil processing, mineral processing, car, air, or other current activities of the population [5]. Green spaces behave like true biological filters that improve the air qualities, due to the ability to fix through the metabolism of various harmful gases in the atmosphere. Phonic pollution occurs because of various daily activities within or outside localities, activities that generate noise with varying intensities and frequencies. Noises can be mitigated by the dense foliage of grasses, arranged in the form of lanes along the roadways or highways passing through inhabited areas. In cities, street grasses and plantations and rare plantations between buildings and small squares reduce very little noise (only 4–5 decibels) with an unseasonable effect. To obtain the maximum sound effect, they usually combine different relief patterns or different panels with sound effects, with plantations arranged in some devices to absorb and dissipate sound waves [6].

3.4. Recreational function

Selection of particular grasses for landscape areas plays a major role in the activation of recreation function throughout the walking and visiting of some picturesque regions, historic

gardens. Recreation function is an organic and spiritual necessity for human beings to escape from the artificial environment of the cities [7]. Recreation can be defined as an activity practiced by a man in his right, in the spheres of culture, art, sports, entertainment, tourism, being an element compensating working conditions, physical, intellectual, or psychological demands to which the person in daily life is subjected in general. The higher these requirements, the greater the need for man to escape from the daily, most of the destinations, in this sense being vegetation areas, urban, or extra-urban green spaces.

The basic tasks of recreation are:

- Relaxation, which removes psychic and nerve trauma caused by tensions or eliminates the temporary fatigue resulting from the daily activity program
- Entertainment or amusement, which removes boredom or the effect of daily automatisms
- The escape through which the individual comes out of his or her usual environment
- Developing personality by which the individual releases for a period the daily automatisms, having creative and innovative behavior and activities

Most of the environments in which contemporary man lives are strong anthropic and often lacking in the conditions of nature. Recreation in nature is increasingly adopted and preferred by the modern person in the urban environment due to the heavily artificial environment in which he operates, but also because of the physical and mental pressure he is subjected to in the various daily situations.

3.5. The function of efficacy

In an exceptional situation, certain grasses can be selected to protect the specific objectives, hydrological resources, and different categories of soil. Thus, some green open space areas have to be provided with special grasses to reduce the spread of harmful substances, open water basins (water accumulations), and drinking water supply installations with a sanitary curtain.

In some other cases, it is necessary to provide around roads regions with special plants that ensure the consolidation of the land or the traffic security (vegetal barriers separating the traffic directions, barriers against the wind, and parasitic effect) [8] by implementing decommissioning projects for industrial and rendering enterprises in the use of the respective territories, by greening the spaces and by landscaping designed to mitigate the visual impact of the installations and the integration of certain specific grasses uses.

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