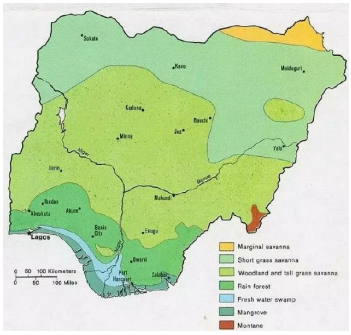

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Reforestation in Nigeria: History, current practice and future perspectives

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Abstract

Nigeria, a country in West Africa, sits on the Atlantic coast with a land area of approximately 90 million hectares and a population of more than 140 million people. The southern part of the country falls within the tropical rainforest which has now been largely depleted and is in dire need of reforestation. About 10 percent of the land area was constituted into forest reserves for purposes of conservation but this has suffered perturbations over the years to the extent that what remains of the constituted forest reserves currently is less than 4 percent of the country land area. As at today about 382,000 ha have been reforested with indigenous and exotic species representing about 4 percent of the remaining forest estate. Regrettably, funding of the Forestry sector in Nigeria has been critically low, rendering reforestation programme near impossible, especially in the last two decades. To revive the forestry sector government at all levels must re-strategize and involve the local communities as co-managers of the forest estates in order to create mutual dependence and interaction in resource conservation.

Keywords

Nigeria; Reforestation; Plantations; Forest Reserves; Future Perspectives

Contents

1 Introduction

Nigeria, a country in sub-Saharan Africa, lies approximately between latitudes 4°16′ N and 13°52′ N; and longitudes 2°49′ E and 14°37′ E with a total land area of approximately 90,895,503 ha (NEST 1992). It is bounded on the east by Cameroon, on the west by the Republic of Benin, on the north by Niger and the Republic of Chad and on the south by the Atlantic Ocean. The climate of Nigeria is tropical with distinct wet and dry seasons. The duration of the seasons varies from the south to the north. The rainfall decreases from the south to the north in terms of duration and intensity. The coastal areas record mean annual rainfall of about 3,500 mm spread between March and November, due largely to the influence of the Atlantic Ocean. This decreases northward to about 625 mm in the far north, where the dry season lasts for about 8 months of the year, influenced by the Sahara desert. The vegetation pattern changes accordingly from the coast to the hinterland. Thus, southern Nigeria harbors the high forest which comprises the lowland rainforest, the freshwater swamp forest, and the mangrove forest types (FDF 1999), while the northern part of the country is occupied by the savanna. The population of Nigeria is 140,020,952 (NPC 2007) and is growing at a rate of 3.3 percent per annum (Okoji 2001).

Nigeria is endowed with rich forest resources. Initially, the whole of Southern Nigeria, approximately 39 percent of Nigeria's land area was covered with the tropical rainforest (NEST 1991). Presently, the Nigeria rainforest occupies about 10 percent of the country's landmass (Akinsanmi and Akindele 2002) but has over the years suffered from large scale deforestation as a result of over-population with its attendant demand for wood and wood products, unsustainable agricultural practices and public infrastructural development, inter alia. However, attempts have been made by both the federal and state governments as well as individuals and organizations at reforesting the forest estates in Nigeria with varying degrees of success. This paper examines reforestation in Nigeria and suggests the way forward for a more sustained environment in the country.

2 Distribution of forests in Nigeria

Nigeria as a country is endowed with many forest types. Some authors refer to them as ecological zones. These forest types were primarily defined by vegetation species assemblages and annual rainfall (Keay 1949). By classification 8 forest types, some of which are closely related, have been identified (Fig. 1). These appear in broad, roughly parallel bands across the country and include the Mangrove Forest, Freshwater swamp forest, Lowland rain forest, Derived savanna, Guinea savanna, Sudan savanna, Sahel savanna and Montane. Each of these zones is defined by its characteristic dominant vegetation.

2.1 The Mangrove Forest

The mangrove forest is also referred to as coastal vegetation. This type of forest is found along the Nigerian coastline particularly around the swampy creeks of the Niger Delta and brackish waterways (Etukudo et al. 1994). The dominant vegetation is the red mangrove belonging to the family Rhizophoraceae. The principal species is *Rhizophora racemosa* Meyer which can attain a height of 45 m and a girth of 2 m at maturity. Other species are shrubby in nature and include *Rhizophora harrisonii*

Leechm. and *R. mangle* L. which grow in dense tangle on higher and relatively drier ground together with *Avicennia nitida* Jacq. (white mangrove).

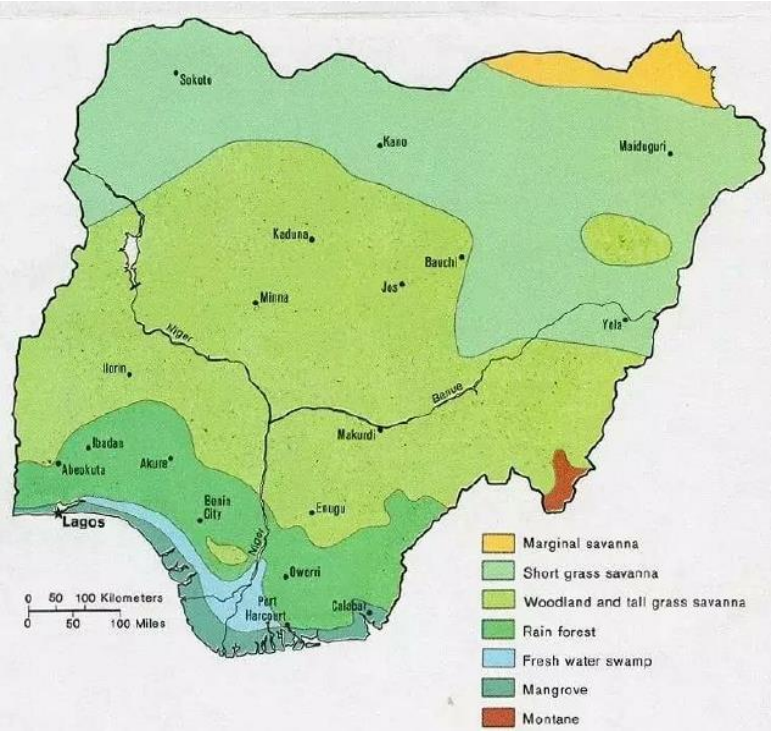

Figure 1. Vegetation map of Nigeria.

2.2 Freshwater Swamp Forest

Next to the mangrove inland is the freshwater swamp forest occurring on marshy areas inundated by freshwater from the numerous rivers, creeks and lagoons especially in the Niger Delta region of the country. Several tree species of commercial value grow in this forest type, some of which are more than 30 m tall and yield valuable timber. They include *Lophira alata* Banks ex Gaertn., *Hallea ciliate* Aubrév. & Pellegr., *Cleistophollis patens*, *Alstonia congensis* Engl., *Piptadeniastrum africanum* (Hook. f.) Brenan., *Anthostema aubryanum* Baill. and *Uapaca spp., Raphia hookeri* G.Mann & H.Wendl. and *R. vinifera* P. Beauv. are also common on the forest fringe.

2.3 Lowland Rainforest

Further inland and next to the freshwater swamp forest, is the lowland rainforest type. It is a high forest zone and very typical of the tropical rainforest. This zone is richest in terms of tree composition, abundance and diversity. Structurally, the vegetation is well defined into recognizable layers with some trees reaching a height of more than 50 m. It is home to the largest number of economic trees of high local and international standard. Some well-known species are the mahoganies such as *Khaya spp., Entandrophragma spp.* and *Lovoa trichiliodes* Harms. Others include *Milicia excelsa* (Welw.) C.C. Berg, *Triplochiton scleroxylon* K. Schum., *Diospyros spp*., *Celtis milbraedii* Engl., *Ceiba pentandra* (L.) Gaertn., *Lophira alata* Banks ex Gaertn., *Terminalia spp., Gossweilerodendron balsamiferum* (Verm.) Harms*, Cylicodiscus*

gabunensis Harms. and *Hylodendron gabunense* Taub. On the wettest sites, broad-leaved evergreen species became more dominant and these include *Lophira procera* A.Chev. and *Sarcocephalus diderrichii* De Wild. & T.Durand (Keay 1949).

2.4 The Savanna

Next to the high forest zone is the savanna which has been categorized into Derived savanna, Guinea savanna, Sudan savanna, and Sahel found at the northern fringe of the country around Lake Chad area. These areas are characterized by low rainfall, high temperature and scanty xerophytic vegetation. They occupy more than half of the country's land area. However, special mention must be made of the derived savanna.

2.5 Derived Savanna

Generally speaking, the savanna is a type of vegetation comprising predominantly of grasses with few trees and shrubs scattered about (Etukudo et al. 1994). The derived savanna represents a transition between the high forest of the south and the true savanna of northern Nigeria. It depicts varying degrees of degradation of the high forest as a result of the slash and burn farming method, un-controlled forest exploitation and grazing. Being originally forest, relict forest trees still remain and together with regrowth form rich woodland where commercial lumbering is practiced. Well known species include *Lophira lanceolata* Tiegh. ex Keay, *Terminalia glaucescens* Planch., *Antiaris Africana* Engl., *Berlinia grandiflora* (Vahl) Hutch. & Dalziel, and *Elaeis guineensis* Jacq.

3 History of Evolution of Forestry in Nigeria

Forestry development in Nigeria is closely linked to the history of the people. Initially, man was a wanderer and moved from one forest area to the other. When population increased, he could no longer rely on fruits and nuts to feed himself. He then settled down, built enclave and took possession of some forest land. That marked the beginning of the forest exploitation on a very limited scale. Machetes, axes and hand saws were the main tools used for timber felling and conversion. Sometimes, it could take months to rip open and saw a single log into fitches of needed dimensions. Exploitation was accordingly low and deforestation virtually absent, except in some patches put under crop cultivation.

However, all that changed with the arrival of the colonial administrators in Nigeria in the 19th century. As townships developed, timber exploitation increased as western styles of building were constructed for offices, trading posts, rail lines and residential quarters. Back home in Europe, timber was needed to feed the giant wood-based industries and the Nigerian rainforest became the principal source of timber supply. Chainsaw replaced the machete and axe, and the rate of exploitation increased astronomically. Plantation agriculture was also introduced and Nigeria witnessed deforestation at a rate never before known in the country. The situation became alarming and measures were taken to minimize the destruction or preserve the forest where possible through legislation (Etukudo et al. 1994). Reforestation thus started, using natural regenerating methods. The colonial administration then came with the

idea of creating "a working forest" (forest reserve) in all varying vegetation belts from the swamp mangrove on the coast to the near desert areas of Sahel savanna (Adeyoju 1975) to be managed and controlled by the Forestry Department in 1916. With this development, many forest reserves were created across the length and breadth of the country between 1916 and 1960, after the amalgamation of the Southern and Northern Protectorates into one country named Nigeria in 1914. The idea was to control timber exploitation in these reserved forests and embark on reforestation as a mean of regeneration/restocking the depleting forests

3.1 Commencement of Reforestation in Nigeria

Reforestation, put simply, is the process of restocking the forest so as to ensure continuous supply of timber and other forest produce in a sustained yield basis. This can be achieved through a natural regeneration method or an artificial regeneration method. Both approaches have been employed in reforesting the Nigeria forests.

At the commencement of reforestation programme in Nigeria, the natural regeneration method was adopted for two reasons. First, was the need to maintain the rainforest in its natural form through regeneration from the soil seed pool. Secondly, and perhaps more importantly, 'as a result of insufficient funds to establish plantations by direct method' (Etukudo et al. 1994).

The first approach was by clearing the vegetation around desired "mother" trees to stimulate natural regeneration through the emergence of seedlings from soil seed pool. Later, the adoption of the Tropical Shelter-Wood System (TSS) was considered a more viable alternative having proved successful in Malaysia. The TSS consisted of timber cutting and poisoning of large undesirable tree species over a period of 3 to 5 years before exploitation in order to open the canopy and stimulate natural regeneration of desirable species (Nwoboshi 1982). Later on, this method was regarded as very cumbersome, costly, and unproductive, and was subsequently abandoned (FORMECU 1999).

Interestingly, while the TSS was going on, some colonial forest officers also pioneered artificial regeneration trials in the moist forest zone of the country. J. D. Kennedy did so at Sapoba, Edo State and D. MacGregor at Olokemeji, Oyo in 1930 using indigenous and exotic tree species under the Taungya Farming System. Until 1944, there was no really systematized method of regenerating high forest in Nigeria with the exception of Taungya plantations – the Kennedy Taungyas of Miliaceae species at Sapoba and the old plantations of teak and Nauclea in Akilla, Olokemeji and Gambari (Adeyoju 1975). Despite the success recorded, the project was stalled due to lack of funds.

In order to continue with reforesting the Nigeria high forest at minimum cost Enrichment planting was introduced as a viable regeneration method. Enrichment planting, according to Akpan-Ebe (2012) is an amalgam of natural and artificial regeneration methods which allows the planting of desirable species alongside the growing stock in the natural forest. The main method adopted was line planting by which strips were cut at intervals of about 10 m or 20 m and seedlings planted in each strip at escapements of 5 m. To be candid, these early methods of forest regeneration failed to give satisfactory results and this prompted the introduction of artificial regeneration which was widely adopted throughout the country in the early 1960's.

3.2 Plantation forestry in Nigeria

Plantation forestry in Nigeria started as soon as the Nigerian Forest Department was established in 1906 in the protectorates. It kickstarted with the planting of *Funtumia elastica* (Preuss) Stapf in Gambari, Ilaro and Oshun River forest reserves. In Olokemeji forest reserve, farmers were encouraged to plant *Milicia* excelsa, a valuable timber species and by 1908 a total of 45,520 seedlings had been planted in various timber licensed areas in Benin (Adeyoju 1975). Planting operations were intensified in 1910 and more species were introduced, including *Khaya* spp., *Milicia* excelsa, *Afzelia spp*., *Nauclea didierrichii* (De Wild. & T.Durand) Merrill, *Tectona grandis* L.f. – all valuable timber species. For more details, see Adeyoju (1975). Commendable progress was made in the area of plantation development and available records showed that in 1920, about 14 different species had been used in plantations throughout Nigeria, out of which 10 were exotic. By 1950, total area of plantations established in the country had risen to 7,468 ha. This was made up of fuel and timber species. The area of timber plantations alone in the country expanded from 3,000 ha in 1961 to 150,000 ha in 1978 (Enabor 1981). The apparent increase in timber plantations might have been a result of the political restructuring of the Nigerian state from the former 4 regional arrangement to the creation of 12 states in 1968 as federating units. By 1993, the number of states had increased to 36. This led to an increase in forestry activities in the different States' forestry departments and the federal department of forestry which also funded plantation developments throughout the country in addition to research and policy issues.

3.3 Trend of Deforestation in Nigeria

There would be no reforestation without deforestation. It might not be out of place to examine briefly the trend of deforestation in Nigeria in order to assess if reforestation is keeping pace with the rate of deforestation in the country vis-à-vis the current practice.

According to Umeh (2005) the value of the Nigerian timber was well appreciated in the international market resulting in rapid expansion of logging activities from the 1930s to 1950s for export. The rape on the forest estates continued in the following decades such that in 1966 Nigeria ranked second among tropical wood exporters. Reforestation was virtually abandoned and by mid 1970s our wood production could hardly sustain the domestic demand and export trade. Faced with this reality, the federal government of Nigeria placed a ban on round wood exportation in 1976. This was, however, followed by a waiver of the ban in 1991 that allowed for the exportation of round logs of *Tectona grandis* and *Gmelina arborea* Roxb. leading to great abuse by 1994 (Bada and Popoola 2005). A case of policy summersault in order to satisfy "political" wood merchants!

A study of land use change in Nigeria between 1978 and 1995 showed that for most states, forests were disappearing at an alarming rate of more than 3.5 percent per annum, such that the forested areas totaling about 4 million hectares (6.6%) of total land area of Nigeria dropped 20 years after to 3.1 million hectares (5.5%) of the total land area (Umeh, op. cit). The trend has continued to slip downwards in all states. For example, the land cover inventory of the Stubbs Creek Forest Reserve in Akwa Ibom State revealed that between 1986 and 2014 the area of high forest decreased

from 23,178.33 ha to 11,659.04 ha secondary forest from 22,918.76 ha, to 12,440.76 ha, while cultivated lands increased from 17,048.03 ha to 35,259.82 ha (Jacob et al. 2015). The study concluded that the Stubbs Creek has lost a total of 95.41% of its original forest area. The story is not different from what is obtained in other forested areas in the country. FAO (2000), following recent developments indicated that Nigeria has by far the highest annual loss in forest area (only comparable to Cote d'Ivoire) in West Africa. From 1990 to 2010 Nigeria nearly halved her amount of forest cover, moving from 17,234,000 to 9,041,000 hectares (FAO 2010).

4 Current Practice in Reforesting Nigeria's Forest Estate

The trend of deforestation in Nigeria has consistently been increasing right from the beginning of organized forestry development in 1906. Reforestation by natural and artificial methods were not ignored either, although most of the plantings then were on trial and experimental plots in the forest reserves. The failure of the Tropical Shelterwood System of forest regeneration compelled the early foresters to switch to artificial regeneration by the establishment of forest plantations in the country. This, as previously noted, comprised both indigenous and exotic species which were chosen mostly because of industrial needs and their fast growth rate.

The slow growth of tropical hardwood such as *Milicia excelsa, Antiaris africana,* etc. which sometimes take 60-80 years to reach maturity, necessitated the introduction of exotic and fast growing species into plantation development in Nigeria. Some of the major exotic species were *Tectona grandis, Eucalyptus spp*., *Pinus spp.* and *Gmelina arborea.* The first two were on the basis of their straight boles and hardness and were used for electricity transmission lines, while Gmelina and Pines were chosen for their pulps used in the manufacture of newsprint and paper. Rural electrification witnessed a boom in Nigeria in the 1970s, while the building of two giant pulp mills in Ogun and Akwa Ibom State took off in mid-seventies.

In 1997 the area of forest plantation was estimated at 150,000 hectares but between 1970 and 1984 a total of 82,434 hectares of plantations were established in the country (Umeh 2005). However the 1998 Forest Resources Survey put the area of plantations in the forest reserves at 196,008 ha and 704 ha in protected areas outside the forest reserves (FORMECU 1999, Table 1).

Between 1985 and 2005, plantations represented only about 3 percent of Nigeria's forest estate. Regrettably, these plantations are today victims of deforestation as most of them have been clear-felled without replacement. According to Umeh (2005) field visitations in 2004 revealed that despite the massive investment in state plantations in the 1970s, the states have not continued to manage them. Bada and Popoola (2005) reported that by 1994, teak (*Tectona grandis*) exploitation in Nigeria had been abused to unsustainable levels. Notwithstanding, FAO (2010) reported that the total plantation area in Nigeria has reached 382,000 ha, out of which Gmelina and teak together account for about 44% (Table 2).

It must be pointed out that Nigeria falls short of the basic standard of acquiring regular and up-to-date on the forest resources and so available information on the forests is either obsolete or based on extrapolation from very old data (Akindele 2010). Therefore, with the last national forest inventory dating back to 1997, most of the information documented in Forest Resources Assessment (FRA) 2010 may not properly reflect the actual situation but be merely indicative (FAO 2010). Reports from many

States' forest services have indicated that for the period 2005-2015, forestry activities in Nigeria enjoyed virtually no patronage from the state governments because of lack of funds. Establishment of Forest plantations has not been sustained partly because of lack of funds and partly due to the non-functioning of pulp and paper industries for which they were originally planned to supply (Umeh 2005) and also due to lack of political will by the government. Governments in many third world countries, as a result of poverty, are not seriously committed to environmental conservation, and with stiff competition in financial allocation to competitive sectors of the economy, forestry is always the first casualty with little or no allocation to that sector (Akpan-Ebe 2016). Nigeria is no exception.

Table 1. Area of Forest Plantations in Forest Reserves and free areas within individual States in Nigeria (FORMECU 1999).

S/N	State	Plantation Area in Forests Reserves (ha)	Plantation Area Outside Forest Reserves (ha)
1.	Abia	4,505	0
2.	Adamawa	1,273	0
3.	Akwa Ibom	2,282	0
4.	Anambara	3,828	0
5.	Benue	2,432	0
6.	Cross River	14,508	1 plantation size unknown
7.	Delta	4,015	0
8.	Edo	21,527	0
9.	Enugu/Ebonyi	13,725	0
10.	Imo	1,253	0
11.	Kaduna	5,867	0
12.	Kano	1,825	0
13.	Kebbi	904	0
14.	Kogi	5,275	404
15.	Kwara	9,752	0
16.	Lagos	1,049	0
17.	Niger	5,588	115
18.	Ogun	39,882	185
19.	Ondo/Ekiti	32,086	0
20.	Osun	9,264	0
21.	Oyo	6,745	2 plantation size unknown
22.	Plateau/Nasarawa	6,957	0
23.	River/Bayelsa	No available record	0
24.	Taraba	1,439	0
	Total	**196,008**	**704**

Table 2. Extent of Land Cover Types (in million hectares) in Nigeria in 2010. Source: FAO (2010).

Land Cover Type	Area	% of Total land Area	% of Total Country Area
Total Forest Area	9.041	9.93	9.79
Natural Forests	8.659	9.51	9.57
Plantation	0.382	0.42	0.41
Other wooded land	4.088	4.49	4.43
Other Land (non-wooded)	77.948	85.58	84.38
Inland Water	1.300	85.58	1.41
Total Country Area	**92.377***		**100.00**

*Total Land area excludes inland water

There is, however, a ray of hope for the four core Niger Delta States of Akwa Ibom, Bayelsa, Delta and Rivers with the on-going Niger Delta biodiversity project which commenced since 2013 in the area. The Community Biodiversity Action Plan is an environment restoration programme. The United Nations Development Programme (UNDP) and Global Environment Facility (GEF) in collaboration with the Federal Government of Nigeria have adopted the Community Biodiversity Action Plan (CBAP) to tackle the problem of deforestation and loss of biodiversity in rural communities of the Niger Delta (Akpan-Ebe 2016). The programme involves a systematic approach of consultations with relevant stakeholders, enlightenment, capacity building and implementation of a pilot scheme of reforestation project by the local people. This project should be expanded and extended to other high forest states in the country.

5 Future Perspectives

The creation of forest reserves in Nigeria by the colonial administration in the early 20th century was with every good intention. The idea was to ensure environmental conservation and sustainable use of the forest resources. However, ceding ownership of these forests to government, who claim to hold it in trust for the people, and excluding the local people from the management of the resources proves to be the undoing for the conservation of these forests in recent years. For as long as the government continues to rigidly hold onto its management to the total exclusion of the indigenous owners of these resources, reforestation of these forests will remain a mirage. At the risk of sounding pessimistic, Nigeria's economy has been in recession for at least two quarters in a row presently, and its recovery may take a very long time. The implication of this on forestry development in the country is enormous. Fund allocation to the forestry sector by the different state governments will continue to decline and may remain so for the next decade or two. Government needs to critically examine its policies and management structure of the already depleted forest estates and re-strategize if we are to re-discover our forests!

With a population of more than 140 million people and an annual growth rate of about 3%, land available for forestry will continue to face stiff competition from other land use practices. At the moment the only available land for forestry development seems to be the denuded forest reserves that the local people are contending. Government strategy must start from here. The future of forestry development and by extension, reforestation in Nigeria is bleak and international aid and intervention can help turn around the sector in Nigeria.

6 Conclusion

The task may be daunting, but all hope it not lost. The solution lies with the government working in synergy with the local people in effort to reforest the depleted forest estates in the country.

7 Recommendations

The government of the different states of the federation should dialogue with the indigenous owners of the forest reserves and draw up a Memorandum of

Understanding that will engender peace between the government and all the stakeholders.

All existing Standing Orders of the various forest reserves should be reviewed and some basic rights denied the people restored especially access to non-timber forest produce which sustain the livelihoods of the local people.

Government must discontinue the present 'garrison' management approach which alienates the people from their forest resources and adopt the Participatory Forest Management Strategy which allows the local people a say in the management of the reserves as this will guarantee the security of any reforestation work in their areas.

The government should invite the private sector to be part of the reforestation programme and allocate land in the forest reserves to them on flexible terms.

The state governments should increase funding to the forestry sector for reforestation work and the federal government should partner with international donor agencies like UNDP, GEF, UNEP etc. for funding of reforestation work in the country as obtained in some states in the Niger Delta region with the local people fully involved.

Finally and very importantly, government must ensure fair and equitable sharing of benefits arising from genetic resources, including appropriate access to genetic resources, and appropriate transfer of relevant technologies as enshrined in the United Nations Convention on Biological Diversity.

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