

Invasive Plants In The Malaysian Landscape

Mustafa Kamal Mohd. Shariff¹ and Shamsul Abu Bakar²

^{1,2}Department of Landscape Architecture, Faculty of Design and Architecture, Universiti Putra Malaysia, Malaysia

Abstract

The increasing use of exotic plants for urban landscaping has presented a new threat to the local ecosystems when the newly introduced plant species thrive out of control—i.e., becoming invasive—in the new environment. If left unchecked, they are capable of displacing local plants; and thereby, causing a disruption to the local ecosystems. The disruptions can contribute to permanent changes this paper highlights the threat and suggests methodologies for the prevention, management and eradication of these invasive plants.

Keywords: Landscape, Invasive Plant, Local Ecosystems, Management

1. Introduction

In Malaysia, like many countries in the formerly colonised world, hundreds of plant species from as far away as South America, Africa, and even China were known to be introduced as ornamentals. Many have become so well adapted to the locality where they were planted that we assumed that they are of local origin. These naturalised plants have adorned our public spaces, roads and home gardens. Others have become a scourge clogging waterways, contaminating agricultural produce and interrupting existing ecosystems. The latter will change the existing local landscapes forever.

As development continues to affect existing landscapes and there is a need to mitigate the post-construction damage to the environment, landscaping has become important. Currently, legislative edict requires that all development to be followed by landscape mitigation work. Furthermore, the rise of urban living quite detached from Mother Nature necessitates the creation of public parks and gardens in the vicinity of housing localities.

It is this need to use plants in the landscape that has made landscape designers to seek more varieties of planting materials for their projects. Procuring exotic

species from outside the locality or even outside the country and region has become “common” practice. Using trees such the Angsana (*Pterocarpus indicus*), Flame of the Forest (*Delonix regia*), Yellow Flame (*Peltophorum pterocarpum*), and Jacaranda (*Jacaranda fillicifolia*) has been implemented since colonial days by municipalities in the country. More recent examples include Khaya (*Khaya senegalensis*), Tecoma (*Tabebuia pentaphyla*), and Andira (*Andira surinamensis*).

This paper aims to highlight the concern in using imported plants species and in particular those species that present a threat to its ecosystem and characteristics. Landscape designers and managers must be aware that these “invasive plants” can damage the local natural environment. Ignorance and apathy could unintentionally contribute to more damage to the environment that one seeking to improve.

2. Invasive Plants

Current literature on the subject defined imported plants that can damage local environment as invasive, nonnative, alien, exotic, or non-indigenous (ESA, 2003). These are introduced plant species that have evolved elsewhere but have been purposely (through horticulture, landscaping, etc.) or accidentally (through contaminated seeds, carried by animals, stuck to clothing, etc) introduced to local environments. Once in the new environment, these plants will grow wild and overtaking many local species. Their success in the new environment is often attributed to the absence of local constraining agents such as pest and diseases, adverse climate, etc. that have checked growth in their native environment.

The suppression, and later on the displacement of local plant species by these newcomers will change the composition of existing plants in that locality. The disruption of existing plant communities will have a serious impact on other living species such as reptiles, birds, and even large animals. These entities are dependent for food, shelter, and other needs to ensure their existence and

continuity from established vegetation in the area. The disappearance of these indigenous plants will compel animals to migrate elsewhere, and thereby, causing instability to the existing ecosystem. Farmers and recreation seekers may be the first to realize the disappearance of some major plants and game-animals. However, the disappearance of lesser-known species is also a cause for concern.

The threat and problems posed by invasive plants have been well documented and highlighted in countries such as the United States, United Kingdom, Japan, etc. Their main concern has been much attributed to the substantial economic loss from contaminated agricultural produce as well as loss of earnings from leisure and tourism. The United States Department of Agriculture (USDA), for instance, estimated the annual loss of crops due to these species to be at USD 7.4 billion.

In Malaysia, the problems posed by these invasive plants have been legally recognised since 1976 with the introduction of the Quarantine Act of 1976. The Act covers a list of plant species deemed detrimental to agriculture and drainage. Thus, the main concern of the Department of Agriculture (DOA) has been more towards protecting agriculture produce (thereby the term “weed” is used) rather than the disruption of ecosystems and the protection of local landscape characteristics.

2.1 Examples of Invasive Plants in Malaysian Landscape

Some examples of landscape plants that have been known to be invasive, and have caused numerous problems are listed below:

2.1.1. Elephant Thorn (*Mimosa pigra*).

Elephant Thorns or *Duri Gajah* is fast becoming a major problem in the landscape not only in Malaysia but also in many other tropical countries. The plant originated from tropical South America but was brought to other parts of the world as green manure and cover crops. It first entered Thailand in 1947 and made its way to Malaysia soon after that. Today, it has spread south as far as Indonesia and Australia causing serious problems to human and animals. They can be seen to sprout out of unlikely places such as TNB’s utility substations, around campuses, along riverbanks and lakes and ponds.



Figure 1: Elephant thorn.
(Photo credit to Forest and Kim Starr)

2.1.2. Water Hyacinth (*Eichhornia crassipes*).

Water Hyacinth or locally known as *Keladi Bunting* is a native of South America and probably has been introduced here in the early 1900’s. This particular aquatic plant has been introduced as an ornamental plant due to its beautiful purple flowers. Its ability to float on water made it a popular plant to decorate fish aquarium, ponds and lakes. Recent studies have shown it to be useful in absorbing heavy metals from polluted water. In Malaysia, this plant is also used to feed ducks and pigs by farmers. However, in tropical climate this plant is a scourge all over the world causing losses to agriculture, water supply, and blocking river transportation. Its fast rate of growth (known to double its population in just 12 days) forms a thick mat of floating roots impossible to penetrate.



Figure 1. Water hyacinth
(Photo credit to Wendy Vandyke Evan)



Figure 3: Recreational lake aerial view before infestation.
(source: Digital Globe 2006)



Figure 4: Recreational lake infested with *Eichornia crassipes*
within a few weeks.

2.1.3. Yellow Acacia (*Acacia auriculaeformis*).

This fast growing tree was a popular roadside tree planted in the Malaysian landscape during the 70's and 80's together with two other Acacia species – the *A. cincinata* (Silver Wattle) and *A. mangium* (Broadleaved Acacia). They originated from Australia, New Guinea and parts of Indonesia. Known locally as Yellow Acacia or *Akasia Kuning*, this tree was planted all over Asia in plantations for pulp and paper as well as soft timber. It is also popular for afforestation and landscaping. Boland (1990) reported that the tree was used for landscaping purposes in Thailand in 1935 and India in 1946. Yellow Acacia's popularity is probably due to its ability to grow easily on infertile urban soils as well as on soils that has been disturbed such as on ex-mining land. Today, this tree is no longer a popular roadside tree in Malaysia but nevertheless it is found to be growing wild and out of control in many open spaces in Malaysian cities.



Figure 5: Yellow acasia.
(Photo credit to Forest and Kim Starr)

2.1.4. Broad-leaved Acacia (*Acacia mangium*).

Another popular Acacia species that has made its entry into our Malaysian landscape is the *Acacia mangium* or locally called Broad-leaved Acacia (*Akasia Daun Lebar*). This handsome tree with light green, broad leaves and conical shaped was introduced as timber trees in plantations for the pulp and paper industry in Sabah in 1966. The tree is native to Queensland, Australia as well as Papua New Guinea, Irian Jaya and in some parts of Indonesia. Today, Broad-leaved Acacia is still planted in parks but its use as street trees has been discouraged because of brittle branches. The threat from this species is that it is found growing wild almost in any open space in cities, rural areas as well as on the fringes of forests. Some even have found their way into national parks and other conservation areas.



Figure 6. Broad-leaves acasia.
(Photo credit to Forest and Kim Starr)

2.1.5. Lantana (*Lantana camara*).

Another plant that has made a way into the hearts of Malaysian gardeners is the Lantana. Known locally by its unpleasant name of Bunga Tahi Ayam (chicken dung flower), this shrub came originally from tropical South America. Today, Lantana exists in hundreds of varieties and hybrids and adorned many home gardens.

However, once escaped into the wild, Lantana can grow as a tall shrub and formed a dense thicket up to 5.0 meters high in open ground. The shrub can also grow as a scrambling plant under the shade of taller trees. Once they found their way into the open ground they will quickly smother other plants.



Figure 7. Lantana.
(Photo credit to Lyons University)

2.2.1. Planned Introduction.

Some plant materials are brought into a new region through planned introduction. These include some grasses, groundcovers, trees and even shrubs that were used as erosion control materials, windbreaks, shade trees, etc. Nevertheless, once introduced into the new habitat, these aggressive species quickly spread beyond control. Historically, many ornamental and landscape plants are introduced to new environments in this manner by travelers, plant collectors and commercial nurseries. These include some of the well-known ones such as the Water Hyacinth (*Eichhornia crassipes*), Bougainvilleas (*Bougainvillea spp.*), and Allamandas (*A. cathartica* and *A. nerifolia*). Many of these species were brought in during colonial times when the English expatriates import them to create a homely feeling or simply to add to their collection of plants to beautify their surroundings.

2.2.2. Escaped from Intended Areas.

There are also invasive species that were introduced as economic plants for food, fodder, and even as pulp and paper. These plants are normally planted in large plantations. Somehow their seeds and propagules escaped to adjacent areas through water, wind and even animals that feed on their fruits and later deposit the seeds in their droppings. Plants that spread through this method sometimes thrive well in their new environment, and their spreads can go unnoticed until they become infestations.

2.2.3. Importation of Other Products.

In the field of agriculture and livestock, contaminated imported seeds that are used for planting crops contaminated seeds of other plants and grow along with the crop but later turned invasive. Similarly, fodder imported for livestock can also be contaminated with seeds of plants unintentionally during harvesting or transportation. These seeds can grow once they germinate out of the animal dung, and can be spread by water or carried by animal hooves. In addition, plants and plant propagules can also spread to new environment unintentionally by ships and containers' carriers. This frequently happens when ships clean their load and dump the waste near harbors. Plants that are washed off ships may be washed ashore and can grow and spread along coastal areas or thrive in rivers and lakes.

2.2 Means of Spreading Invasive Plants

There are a number of ways for introducing the invasive to a new environment. They include:

2.2.4. Natural Migration.

Nature has means of ensuring continuity of its species. One way of doing this is through the spread of seeds by wind, water, and the movement of human and animals. The plant seeds that are spread by wind will travel far and wide following air currents and may land in new environment that is conducive to their growth and spread. Some of them will survive, and thrive after overcoming competition from native species. Similarly, seeds and fruits can also be spread by water. They find their way to a new locality through rivers and streams and may end up in lakes and even in coastal areas. At other times, flooding incident also helped seeds to spread to other areas affected by the flood. Additionally, human and animal movement may help to spread other types of seeds. These seeds may hookup to clothing and animal furs, and may drop along routes taken by these unsuspecting carriers. Sometimes animals and birds that eat fruits and berries will naturally help the spread of these plants along with their droppings. One good example of plants that spread through this way is the Ficus (*Ficus religiosa* and *F. benjamina*), which can be found growing on trees, along cracks in walls and rooftops.

2.2.5. Overuse of Land.

Improper land use put stress on the local ecosystem and may upset the existing balance between plant associations. These stresses can be experienced through land clearing activities, off-road vehicle uses and even by recreationists who are allowed to use natural areas beyond their carrying capacity. It has been reported that an ecosystem that is experiencing stress will not be able to maintain its balance, and thereby exposing it to further threat from invasive species.

2.3 Heightened Threat From Invasive Species

The threat from invasive plants in the landscape is expected to grow in the future due to several reasons. These are:

2.3.1. Concern for Biodiversity.

Biodiversity or biological diversity is the diverse composition of plants and animal species living in a complex interaction among each other. This diversity of life form is essential to the continuity of life on Earth. This makes every region of the world possess their own unique biodiversities, and hence, its own landscape characteristics.

Malaysia, having one of the oldest rainforests on earth, has been identified as one of the 12 mega-biodiversity countries in the world. It is estimated to have 15,000 species of flowering plants, 286 species of mammals (such as the Seladang, Sumatran Rhinoceros, etc.), 150,000 species of invertebrates (such as snakes, worms, etc.), and 4,000 species of fishes. This rich biodiversity is a treasure trove for future generations. It has been said that the "Green Gold" reserve that Malaysia inherits will sustain her economy well into the future even surpassing its petroleum reserve.

The threat to biodiversity of a region from invasive species happens when an introduced species is able to colonize existing ecosystem and suppress local species into extinction. This will alter the whole ecosystem balance, and contribute to the disappearance of many plants and animals of unknown potentials. In this scenario, one cannot imagine the lost opportunities had invasive species obliterated rubber trees, oil palm, or cacao shrubs before we discover rubber, palm oil, and chocolate!

2.3.2. Increase In Global Transportation and Cross Border Movement.

Tremendous stride made during the last decade in the field of communication and transportation technology has contributed tremendously to the way we conduct business on the inter-regional or intercontinental level. Today, a massive volume of living and non-living materials is being marketed across regions.

While these across border exchanges of information, people, and other substances can be seen as great opportunities for improving our livelihood, they also bring about a number of associated problems. An instance is the increase in cross border entry of living organisms. Export of living organisms such as live animals, fish, and plants to satisfy demand from other regions of the world; or the production of foreign plants and animals in foreign countries where the labor costs are much cheaper, and importing it again into the country of origin can contribute to the spread of foreign organisms worldwide.

The potential hazard brought about by inter-regional exchanges of living organisms need to be closely monitored because only a few pieces of plant propagules can spread very quickly, and become uncontrollable within a short span. In the United States, for instance, the importation of Kudzu (*Pueraria lobata*) for roadside erosion control, for instance, has been proven to be an expensive and difficult problem to handle.

2.3.3. Taste for Foreign Plants and Animals.

The demand for exotic plants and animals is another contributing factor for the spread of invasive species across regions. Our love affair for exotic and rare plants is not anything new. Plants were transported across regions in ancient times to adorn the palaces of kings and emperors for thousands of years. Nevertheless, the importation of foreign plants had been limited to only the elite connoisseurs and researchers in past societies. However, it is now becoming a hobby for everyone who has a taste and time for it.

Improved communication and transportation have made the transfer of these organisms easier and cheaper. Today, using improved technology, living organisms can be transferred in good conditions over long distances. Through the use of e-commerce, consumers can order plant materials such as orchids, and Venus flytraps without leaving their homes. This necessitates a review of quarantine and importation procedures.

The problem with this infatuation with exotic plants, animals, and fishes is that they quickly go out of fashion. These exotic novelties are known to be discarded into the dumpsites, rivers, and even the open grounds when they are no longer being favored. Dumped materials may survive, find their way to fertile environment, and later thrive out of control.

2.3.4. Increase Landscaping.

There has been an increase in landscape development activities in this country in the last 20 years. This is due to the rapid physical development, and the need to balance this development with environmental improvement. Various programs and awareness campaigns have been introduced to encourage the public to participate in these projects. Today, we find that “landscaping” (i.e., the term given to activities to beautify the landscape) is a household word.

This has led to the use of many attractive imported species from other tropical or subtropical regions. However, the indiscriminate use of these plants, without knowing the nature of their growth and mode of spread, is unwise. This is especially true in areas bordering natural and pristine forests. Seeds and other plant parts can spread into our forested areas, and have potential for causing problems with local ecosystems. This can be seen in the case of Broadleaved Acacia (*Acacia mangium*) as well as Bougainvilleas and Allamandas. They have spread out into our forests, and on islands. Experiences in other countries have shown that aggressive exotic plant species can severely interrupt local ecosystems, and changing a whole region of pristine forests.

3. Avoidance Strategy for Invasive Plants

Avoidance has always been regarded as a better alternative to overcoming problems with invasive landscape plants. Landscape designers and managers should first adopt this strategy in their projects. Among the approaches that they can adopt are:

3.1 Use Local Species Whenever Possible.

More effort should be done to introduce indigenous plants into the urban landscape. Better selection of plant materials with required functional and aesthetic characteristics need to be done. They should also be screened for potential problems when introduced into the urban environments. Perhaps, a special program can be initiated in local universities and research institutions to identify, select, and adapt indigenous plants to their new habitat.

3.2 Screening for New and Unknown Exotic Species.

All newly imported ornamental plants should be properly screened, and quarantined by the relevant authorities. The authorities should be familiar with the expanded threat of invasive plants to landscapes. Landscape architects also need to check with other international centers that are monitoring invasive species in similar climate to Malaysia.

3.3 Monitoring and Early Intervention.

All newly introduced plants must be closely monitored for signs of invasiveness. Local authorities should work closely with project consultants, and local universities in periodically monitoring these plants. An efficient mean of disseminating information such as, through websites specifically set up in the National Landscape Department can aid in educating interested parties to the potential threat of these plants.

3.4 Risk Area Zoning

The greatest threat of invasive plants is to pristine natural environment, rural-agricultural areas as well as the unique island ecosystems. Other areas such as, city centers may face only minimal threat. Accordingly, risk area zoning can be introduced for landscape areas. These range from high-risk zones such as, recreational forest to low risk zones like city parks. Newly introduced exotic and local species should be planted first in areas of low risk zones before being introduced to higher risk zones.

4. Management of Invasive Plants

The management of invasive plants should include both preventive as well as corrective measures. Preventive measures are steps that can be taken to exclude invasive plants from local landscapes. Among the first actions to be taken shall include:

4.1 Legislative Control.

Legislation needs to be drawn requiring government agencies to monitor the introduction, and spread of foreign plants; and to eradicate these plants once they are identified as being invasive. The law must also compel plant growers to destroy their plants that have been identified as invasive.

In Malaysia, this task has been delegated to the Department of Agriculture, which enforces the Plant Quarantine Act 1976. Section 6 of the Act listed the plant species that must be controlled and outline the method to destroy them. It also stipulated a fine of not more than RM 1000 for failing or refusing to destroy invasive plants. Nevertheless, the list focuses only on plants that are considered to be “weeds”. However, plants that can cause destruction to local ecosystems are not included in the list. Efforts should be made to expand and constantly update the list of plants to include those that are invasive beyond agricultural concerns.

Monitoring and checking the spread of invasive species require inter-agency cooperation. This is because invasive plants spread over large areas regardless of political or agencies’ boundaries. Thus, the legislation must require other agencies such as, the Forestry Department, the Wildlife and National Parks Department (Perhilitan), the National Landscape Department, District Offices, and other land authorities to be aware of the problem.

4.2 Awareness Campaign.

Much of the problem regarding invasive plants in the landscape can be handled if more people are aware of it. The routes taken by invasive plants can varies such as, accidental introduction by ships at harbors; brought in by wind, and water from neighboring lands; as well as introduction as ornamental, and landscape plants. The latter will be very significant in the coming years as their popularity increased with the importance of plants in improving the quality of living environment.

Creating public awareness on the potential problems that some plants may be causing to local environment is an important first step in preventing the introduction and spread of invasive plants. The right information must be made available to the public whose cooperation is crucial in controlling the menace.

4.3 Removals and Control.

Complete removal of invasive plants within a particular small locality can be done if the problem is detected early. Manual and chemical removals have been the most common method employed. However, these are proven less efficient if the spread is severe.

The use of herbicides is an effective method of control. These chemicals are painted to the wounded trunk of trees or sprayed over small shrubs, climbers, and creepers in order to kill them. Nevertheless, this effort may affect and eradicate non-targeted plants as well. Chemicals are also expensive, and must be applied at the right time. Their potential hazards to animals while contaminating rivers and lakes must be weighed together when choosing their application. Due to their toxic nature, these chemicals must only be handled by trained applicators especially in areas close to the public.

In countries where labor is cheap, using mechanical means of controlling invasive plants may be feasible. Mechanical methods include using machines to cut down invasive plants or using labour to eradicate these plants manually. The effort is tedious and progress is often slow. With some species such as, the Elephant Thorns (*Mimosa pigra*), which possesses sharp and long thorns, it can also be dangerous.

Newer means of control include using “friendly” organisms to check the spread of problematic organisms. Biological control has been successfully applied to manage the spread of invasive organisms—such as the African Honeybee and Army Ants. The use of certain fish species to control aquatic weeds and mosses is another potential. However, using biological control can be a double edge sword as the predators could in turn become invasive once introduced in a new environment.

Keeping the land and existing ecosystem in a healthy condition is another alternative in controlling invasive plants. A healthy plant community generally results from a land that is not under stress due to destructive activities. This is important because exotic species will be controlled in such communities.

5. Conclusion

New plant materials are constantly introduced for urban landscaping. Many of these are exotic plants that can present a threat to local landscape ecosystems. Invasive plants are plants that grow wild in a new environment and threaten to disrupt these ecosystems. This disruption may lead to permanent changes to the landscape characteristics of a locality and region. Efforts must be made to create awareness of this threat among all those involved in landscaping. This paper highlights the problem as well as suggests ways for better managing this threat.

6. References

- Boland, D.J., et. al. (1990). *The Habitat of Acacia auriculaeformis and probable factors associated with its distribution*. Trop. For. Sci., 3(2), 159-180.
- Callaway, R.M. and Aschehoug, E.T. (2000). *Invasive plants versus their new and old neighbors: A mechanism for exotic invasion*. Science 20, Vol. 290 No. 5491 October: 521-523.
- Morton, J.F. (1994). *Lantana and red sage (Lantana camara L.), notorious weed and popular garden flower: Some cases of poisoning in Florida*. Econ. Bot. 48: 259-270.
- Tham, C.K. (1979). *Trials Acacia mangium Willd. As a plantation species in Sabah*. Forest genetic Resources Information 9. FAO Forestry Occasional paper 1979 (No.1).
- The Star. (2005). *Stop invasive alien species*. The Star Publication 11 Oct. [http://members.lycos.co.uk/Woody Plant Ecology](http://members.lycos.co.uk/Woody_Plant_Ecology)
<http://www.ento.csiro.au/weeds/mimosa>
http://www.hear.org/pier/species/acacia_mangium.htm
<http://esa.sdsc.edu/invas3.htm>
<http://www.agrolink.moa.my>
<http://earth.google.com>

“Let every dawn of the morning be to you as the beginning of life. And let every setting of the sun be to you as its close. Then let every one of these short lives leave its sure record of some kindly thing done for others, “some good strength or knowledged gained for yourself,”

- John Ruskin