Plant Material Propagation: Catering for the Landscape Architect

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INTRODUCTION

With the purpose of highlighting the landscape architect's involvement with plants in the course of executing the planning phase of a project, and to show where and how plant material is applied during this process, it is necessary to describe the various steps of the landscape design process briefly. Once this background is set, the impact of current availability of indigenous plant material on the success of the designs will be considered. The conclusion will focus on the needs of the landscape architect in the form of a wish list and a few recommendations for the future will be made.

BACKGROUND

Historically, from an availability point of view, it has been much easier designing with exotic than with indigenous plants. The history of the use of plant materials and the influence of the northern hemisphere in this regard is quite important. Garden styles developed over many centuries and horticulture responded to these in grand style by creating a plant material palette to suit each era. The historical development of countries and their trade amongst one another is reflected in their landscapes and the use of newly encountered and acquired plants increased as the globe was conquered. All this knowledge and the relevant northern hemisphere plant materials found their way to our shores, in particular through the old parks departments of local councils and the council nurseries. Many of the horticulturists in their employ during those days had studied in the United Kingdom and brought their experience to South Africa. This has left us with a legacy of exotic plants that cannot be discarded overnight. This situation has, however, become environmentally unacceptable and also inhibits the potential of creating a large indigenous plant supply.

To set the stage it is perhaps necessary to indicate what, in terms of plant material, is currently available to the landscape architect. The basic starting point here is the general grower's catalogues, price, and availability lists that general growers make available from time to time. Certain basic standards, mainly intended to satisfy the retail market, are set for the majority of plants listed. They have to grow easily from seed or cuttings, grow reasonably fast to a size acceptable for the market, be easy to maintain in terms of feeding and pruning and be disease resistance and last by not least, be highly attractive and guaranteed sellers on the floor. These factors all contribute to keep the grower's stock moving and earning him/her a successful business. When these lists are inspected carefully, the conclusion is drawn that the main criterion according to which most indigenous plants, excluding trees, manage to appear on these lists are above all, the attractiveness of their flowers.

The second source is the catalogues of plant material supplied by specialist propagators of indigenous plants, again with the intention to mainly satisfy the

demand of the retail market, created by the current wave of "planting indigenous" to save water or to attract birds into the home garden. With that as background, the next step would be to consider the process of landscape design, and how plant availability affects the end result of a landscape design.

THE PROCESS OF LANDSCAPE DESIGN

Landscape architecture is defined as being a form of art by which the earth's surface is modelled and shaped on a scientific basis into surroundings, often picturesque, that suit a variety of human activities. Landscape architecture involves the planning and design of all open space, be it interior such as atria or exterior such as parks, home gardens, golf or office park estates. Landscape architecture also involves dealing with the natural landscape by restoring it after constructions such as roads, bridges, or dams have cut into it, or by rehabilitating the natural landscape when lesser developments have caused the landscape to deteriorate somewhat. This description of landscape architecture leads to dividing the work into two distinct categories, i.e., restoration of natural landscapes and designed landscapes.

Landscape Restoration. In an extremely simplified way, supplying materials for the restoration of the natural landscape is in some ways easier. The supply of plant materials in this regard is two-fold, and entails harvesting and supplementation. The first entails harvesting from the natural environment before the project commences. This includes collecting seed over a period of time for hydroseeding, and tree and shrub rescue from the project area and growing them in containers for later planting back to the site. Supplementation implies that harvesting alone might not be sufficient and therefore the planting can be supplemented by the supply of trees and shrubs that naturally occur in the area and have been specifically procured or grown for the particular project.

Landscape Design. The designed landscape is the more important section in terms of plant material supply because it presents a greater plant use opportunity. Landscape design emphasises the concept of spatial relationships and aesthetics. This category of landscape architecture is a more direct form of art, applying hard and soft surface materials to the landscape as an artist would apply paint to a canvass. The application of plants within the field of landscape architecture is collectively called planting design and forms the basis for this part of the discussion. The following review will explain where planting design fits into the whole process, which consists of two main sections, namely site planning and detailed design.

Site Planning. Site planning involves:

- Site analysis (internal and external natural and man-made features and influences).
- Identification of the needs and requirements of the user and the resultant demand thereof upon the site.
- Zoning and circulation planning to achieve the solution to the spatial arrangement of the activities, and lastly.
- Synthesis of the aforesaid into a schematic prefiguration of the layout proposals, called a master plan.
- Once the designer has completed a master plan, the process moves on to the more detailed level of design.

Detailed Design. Detailed design involves: (1) A sketch plan presenting the execution of the concept, objectives, and design principles; (2) The supporting drawings of site engineering solutions, and, (3) Planting design.

Planting design involves the extensive use of plants and their combinations to give expression to the concepts developed for the design, and gives specific quality to the conceptual spaces created on plan. It culminates in the proposal of a list of specific plant species to be used in a particular design. In this regard the landscape architect can opt for any of the following points of departure:

- Pure design-based planting, using any plant, of any origin — indigenous or exotic — that would complete or give absolute meaning to the design;
- As above, but using only indigenous plants from any part of the country;
- Create/adapt the design to accommodate only local indigenous species; or;
- The design being such that it simulates nature as far as possible in any part of both the functional and aesthetic application of plants.

The planting design process is solution-driven plant material application. Two categories are identified:

- Functional solutions: The pure functional solutions to site and user needs, are screening, shade provision, creation of microclimate, etc.
- Aesthetic solutions: Aesthetic solutions of the design are dealt with on three levels.

1) A basic aesthetic solution: This is achieved by creating spaces with walls, floors, and ceilings, and perhaps also, if required, by manipulating those spaces to become smaller or larger, closer or further away by applying line, colour, texture, focal points, repetition, etc.
2) The contextual application of the basics: Styles such as formal, informal, tropical, seasonal, or Japanese as well as the current ordered informal indigenous style for example form the context within which the plant material application takes place.
3) Enhanced aesthetics: In conjunction with the basics, enhanced aesthetics are applied by stimulation of the senses, i.e., sight (colours, textures, shapes), touch (surface textures), smell (flowers, fruit, and leaves), taste (flowers, fruit, and leaves), and sound (rustle of leaves, stems, seed in dried fruit pods, etc.). In addition, the enchantment of wildlife is added to the aesthetic experience by addition of elements for butterflies, birds, and beasts for their breeding, feeding, resting, and nesting requirements.

Plant material selection includes the following:

- Planting spot specification: From the abovementioned processes a point is reached where each planting spot in a specific design has a very detailed specification in terms of function and aesthetics. For example: a screening plant in a public open space, 2 m tall, forming a dense wall, that should be perceived to be far away, and be colourful. It is also part of an informal design depicting movement through the various seasons. The plant should also impart a

fragrance and attract birds. In addition, aspect, as well as climatic and soil conditions needs to be taken into consideration. This process is repeated for each of the planting spots within the design. From this arises lists of required plant species characteristics.

- Plant species characteristics: When plant species characteristics are considered, they can be grouped into a number of encompassing basic criteria where no subjective application evaluation is included, i.e., no subjective deduction is made as yet to categorise a plant as an ideal street tree. These basic criteria would include growth form; plant size, visual shape, growth rate and life expectancy; colour of the trunk, new growth, flowers, leaves, fruit; texture of bark, leaves, the plant as a whole; leaf type, shapes, and size; inflorescence and flower types, shapes, and sizes; flowering and fruiting times; root characteristics and preferences; metamorphic organs; fragrance; poison; edibility; ecological characteristics such as minimum and maximum temperature tolerance, water requirements, wind tolerance, humidity preference, exposure to light intensities, region of occurrence, specific habitat, soil texture, pH and drainage preferences, tolerance to pollution, attraction to birds and other wildlife for their specific needs; and lastly litter production, pest, and disease tolerance/resistance, as well as practical use such as cut flowers and medicinal aids. To each criterion a number of specific categories can be assigned, i.e.,
  1) Criterion: Flower colour — would include a complete range of categories from primaries through all their combinations as well as shade and hues by adding the neutrals of black and white, as well as degrees of brightness.
  2) Criterion: Minimum temperature — would include for example very hardy (below -12°C), hardy (-5°C to 12°C), semi-tender (0°C to 05°C), and tender (above 0°C).
  3) Criterion: Shape/form — would include categories such as round, conical, triangular, bushy, flat crowned, candelabriformed, weeping, slender or wide, sedentary, or stemmed or grafted standard.

When the earlier planting spot specification example is considered, this leads to the following description in terms of plant species characteristics: an evergreen dense shrub; 2 m tall; pastel coloured flowers in pink, mauve, blue; dull green to grey leaves, finely textured with a sweet fragrance; no thorns or spines; and either flowers or fruit that attract birds. It should be able to grow in an open aspect, with minimum temperatures of the region falling to -7°C in winter, an average annual rainfall of approximately, 550 mm per annum, and no major dropping of leaves, flowers or fruit — a grouping of 14 specific requirements.

CONSIDERATION OF THE IMPACT OF CURRENT AVAILABILITY

Range of Available Material. The apparent combinations of the various criteria and categories as listed earlier are numerous and to each specific set a plant name needs to be attached. Quite often the conclusion is reached that the perfect match for all possible situations is unattainable given current availability of indigenous

material. Certain trade-offs need to be made in terms of changing certain requirements in order to complete the planting design. Therefore, propagators should move closer to satisfying as many of the parameters as possible, and for that a much larger palette than the current list of available plants is needed. The palette also needs to move away from only supplying colour and attracting bird life, to also accommodate many of the other criteria mentioned above. A need exists to supply more than just focal elements for a design, but to also supply background elements and fillers.

The Environmental Framework. In terms of the more practical implication and current tendencies in landscape design, an added consideration to the above is that each project has to happen within the environmental framework of the region in which the development is taking place. An identity statement of place needs to be made through the planting design. Depending on where that region is, and bearing current commercial availability in mind, the solutions are either easy or more difficult. The following should be considered:

- The greater occurrence of development in South Africa, in terms of industrial and office park developments and then the related housing developments in need of designed landscapes, exists around the major cities and metros of the country, i.e., Cape Town, Port Elizabeth, East London, Durban, Johannesburg, Pretoria, Nelspruit, Rustenburg, Pietersburg, Bloemfontein, and Kimberley. When the publication edited by Low and Rebelo is consulted, the vegetation communities represented by these cities result in the following:
  - Cape Town Metro: Dune thicket, west coast renosterveld, mountain fynbos, and sand plan fynbos.
  - Post Elizabeth-Uitenhage Metro: Dune thicket, mesic succulent thicket, south and south-west coast renosterveld, and grassy fynbos.
  - East London: Coastal forest, dune thicket, and eastern thorn bushveld.
  - Durban Metro: Valley thicket, and coastal bushveld/grassland.
  - Johannesburg-Midrand-Centurion: Rocky highveld grassland and moist cool highveld grassland.
  - Petoria Metro: Clay thorn bushveld, mixed bushveld, and rocky highveld grassland.
  - Nelspruit: Sour lowveld bushveld.
  - Rustenburg: Clay thorn bushveld and mixed bushveld.
  - Pietersburg: Mixed bushveld.
  - Bloemfontein: Dry sandy highveld.
  - Kimberley: Kimberley thorn bushveld.

This presents quite a diverse set of plant material requirements. Especially when the trend has become to plant what grows in the area in order to naturally fulfil the needs of the plant and to avoid artificial augmentation—especially when it comes to the water requirements of plants—what almost could be called sensible landscape design.

Two of the vegetation communities listed above that are perceived to have not received too much attention in terms of propagation by comparing availability lists of commercially available plants to the species listed for these vegetation commu-

nities, are those covering the Port Elizabeth-Uitenhage Metro and the Johannesburg-Midrand-Centurion areas. They are represented by the dune thicket, mesic succulent thicket, south and south-west coast renosterveld, grassy fynbos, rocky highveld grassland and moist cool highveld grassland. If the design concept is to simulate nature, certain vegetation communities need to be represented by a larger list of commercially available plant species. In addition, a start would be to identify the plants that are common to as many vegetation communities as possible and to start growing those to cover as large as possible base.

Also on the subject of vegetation communities, the next issue returns to the issue of the restoration of natural landscapes. Infrastructural developments such as roads and dams occur throughout the country and therefore could be in any number of vegetation regions. To be of service, should additional plants need to be acquired as mentioned previously, it would be necessary that a larger range of plants from a wider spectrum of vegetation communities should be propagated.

Procurement of Plant Materials. Further to the abovementioned, and including designed landscapes, another situation should be considered which deals with the procurement of plants. Two scenarios are put forward. Firstly, some projects, mainly design projects, happen extremely fast from planning to planting, requiring plants to be available immediately. To cater for this type of demand larger numbers per species should be available. Often a situation occurs that a shortage of numbers are experienced when landscape architects call for more than 50 plants of less common species. The second scenario is one where the project time span, true for most large-scale developments and rehabilitation projects, covers at least 1 year, perhaps even longer. This situation, where the timing of the planting phase of the landscape construction is known well in advance, allows for the procurement of plants ahead of time and creates the opportunity for propagating and growing specific species on a contract basis for the particular project. In this regard it is therefore necessary to know which growers are able to render contract growing for the industry, and who will be able to grow what. Close ties between the landscape architects and the growers need to be developed to enable the landscape architect to specify his plant material realistically.

Scientific Support. The current planting designs seem to become more and more indigenous orientated. Some landscape architects are starting to use plants from within the region of the development. With the shortage of variety, especially in certain regions, new "designer" combinations, as opposed to natural communities, are being made. It is therefore important that research be undertaken to establish whether the newly created species groupings could become sustainable plant communities. Are landscape architects perhaps playing a role in constructive modification of the environment, or would this perhaps over time lead to driving other species out of their niches which under no circumstances should be allowed?

South Africa's resource in terms of vegetation is one of the world's largest, a major opportunity on the propagators' and growers' doorstep. Many overseas horticultural/floricultural concerns have already taken the initiative and are continuously ready to take advantage of the horticultural significance of South Africa's indigenous flora. The amaryllis, pelargoniums, barberton daisies, and freesias immediately spring to mind in this respect. Many more recent publications have whetted the landscape architects' appetite, by people such as Joffe, Onderstall, Pienaar,

Pooley, van Wyk, and Smith as well as the nine field guides under the auspices of the Botanical Society. Furthermore, exotic plants are generally speaking hardier and large cultivar variations within species are available, i.e.,*Alstroemeria* - at least 11 cultivars; *Argyranthemum* - 16; *Bougainvillea* - 22; *Coprosma* - 7; *Hebe* - 15; *Hemerocallis* - 11; *Hibiscus* - 16; *Lavendula* - 10; and *Phormium* - 14. Many of the species mentioned above are used so abundantly that many lay people actually think that they are indigenous. Therefore, once the necessary groundwork has been done to cultivate a wider range of plant species, the next step would be to improve by selection and maybe also genetic engineering, hardier plants in terms of temperature, and drought tolerance, as well as wider ranges of colours and other aesthetical attributes.

Practical Considerations. The aforementioned hopefully deals with the variety of choices needed. In addition to that the format and quality in which these materials are supplied, as well as the cost, should be considered. Only a few importance aspects in this regard need to be highlighted. For large-scale developments, where large quantities of ground cover types or small shrubs (< 1 m) are required, they need to be supplied in small format, such as plugs, in order for the project to be cost effective.

To date many growers have set supply to the retail market as their goal and have set their standards accordingly. The plants look good in their bags when they leave the propagation section for the market floor. It is, however, also important that they grow well in the landscape, which implies that the quality of the material should be high, i.e., well rooted, hardened-off, established and healthy plants, whether small or large specimens.

Conclusion. When all the above issues are concerned, and we compare our wish list to what is currently available, it becomes quite apparent that the designer's indigenous palette is limited at this stage and, therefore, especially in certain areas, the resultant landscape "pictures" become somewhat boring and repetitive and stifle creativity in terms of planting design, the end result being a designed South African landscape that is universally bland. The palette of the landscape architect cannot be complete when only the basics, such as the primary colours for a painter, are supplied. Unlike the artist he/she cannot mix the basics to create a palette of unlimited colour variations. The landscape architect needs to mix lines, colours, shapes, textures, etc. in order to achieve the desired effect of his landscape "picture".

RECOMMENDATIONS TO FULFIL THE NEEDS OF LANDSCAPE ARCHITECTS

Recommendations. A summary of the above culminates in the following recommendations:

Improvement of the Variety of Available Material.

- Propagators should move closer to being able to satisfy as many of the plant characteristics as possible. The new palette also needs to supply more than just focal elements for a design, but also background elements and fillers.
- Vegetation communities need to be studied and plants for propagation should be identified to enlarge the list of commercially available plant species.

- Propagate and grow larger numbers per species.
- Set up a list of growers that are able to render contract growing for the industry as well as indicating the spectrum of plants that could be provided by the growers.
- Develop closer ties with the landscape architects to enable landscape architects to specify plant material realistically.

Offer Scientific Support.

- Initiate and coordinate research to be undertaken to establish whether the newly created species-groupings could become sustainable plant communities. Verify the scenario of landscape architects playing a role in constructive modification of the environment.
- Improve by selection, and maybe also genetic engineering, hardier plants in terms of temperature and drought tolerance, as well as wider ranges of colours and other aesthetical attributes.

Recognise and Deal With Practical Considerations.

- Start supplying groundcover types or small shrubs (< 1 m) in small format, such as plugs, in order for projects to become cost effective.
- Ensure high quality of the material, i.e., well rooted, hardened-off, established and healthy plants, be they small or large specimens.
- Revisit the current price structures in the industry to present a reasonable and affordable price structure and stimulate a large turnover.

Addressing the Recommendations. A point of departure to fulfil the needs of landscape architects would be to consider the role of introduced plant species in the South African horticultural industry and how it can assist in creating a more substantial indigenous plant material market.

A Comparative Selection Process. A useful exercise could be to take the list of available exotic material and compare them on aesthetic grounds to indigenous counterparts, i.e., we could compare *Nandina domestica* to *Halleria lucida, Gardenia augusta* (syn. *G. jasminoides*) to *Oncoba kraussiana* (syn. *Xylotheca kraussiana*), *Jasminum polyanthum* to *J. angulare,* or *Berberis thunbergii* f. *atropurpurea* to *Combretum celastroides* subsp. *orientale* in winter. This would create an immediate result of what types of indigenous plants could be added by the growers and for which there probably would also be an instant market. Also, if the counterparts of the wide range of hardy, low-growing, colourful exotic ornamental grasses such as *Acorus, Carex, Festuca, Holcus, Liriope, Ophiopogon,* and *Phormium* could be identified, they would all be guaranteed winners. In this field the restios are coming onto the market, but quite often these plants from the winter rainfall region, struggle to adapt to a summer rainfall regime, especially where the landscape is not irrigated sufficiently. The indigenous counterparts of the following few exotic species would also be welcomed: *Coprosma* and *Euonymus* —small, evergreen, medium-textured shrubs (< 1 m); as well as *Prunus laurocerasus* and *Viburnum odoratissimum* — large, evergreen, fast-growing, dense shrubs.

Development of Identified Potentially Successful Species. Certain groups of indigenous plants have been identified as potentially successful species for the

market. The genus *Rhus* has already delivered quite a number of specimens and has the potential of delivering many more, especially those species in the small shrub and trailing groundcover group. The list of available indigenous climbers and very hardy, shade-loving groundcovers are often inadequate and should also be expanded.

PROPOSALS FOR THE WAY FORWARD

The challenge of responsibility towards South African indigenous plant materials, their cultivation, and selection enhanced/improved specimens should be taken up. It will take time. However, if addressed actively and in a coordinated manner by embarking on a major holistically approached plant propagation development project, with clear goals and objectives, it will be achieved. A project should be formulated where each individual in the industry can indicate the specific role he/she wishes to play to achieve the end result. To achieve this, two levels of planning need to be undertaken. Level one being the input of the Society as such and level two being the input of the individual members. The following is needed:

LEVEL 1 - THE ROLE OF I.P.P.S. (SA)

Bear the wish list in mind, translate the need in terms of a specific species list.

- Categorise the list in terms of development opportunity, i.e., immediate results possible, medium-term results — minor research required, and long-term results — major research and development required.
- Assign project to participants (propagators and growers, post-graduate students, and communities).
- Identify the gaps and problem areas.
- Propose a long term plan to overcome the problems and to fill the gaps and thereby setting the goals for the International Plant Propagators' Society (S.A.) for the new century.
- Market not only the plants, but the research findings by creating a web page to indicate what is happening in the industry, what research is being undertaken, what possibilities and problems are present.
- Participate in projects aimed at educating the public on a continuous basis regarding all aspects of indigenous planting. (Many people are under the impression that by planting indigenous, they will save water. They are also under the impression that only succulents are drought resistant).
- Set up a closer relationship with landscape architects through annual workshops.

LEVEL 2 - THE ROLE OF INDIVIDUAL MEMBERS

Identify the markets that the individual member wishes to service, i.e., propagating for retail markets, the landscape industry, wholesale farming for commercial export of proteas for example, or a combination of any or all of the above.

- Set personal objectives to reach the set goal in terms of service delivery.
- Market the service type as well as the products.
- Build a relationship with the user market through mailing, fax, email, or Internet.

- Offer the personal field of service to the Society in terms of where the individual would like to fit into the overall plant propagation development project.

It is known that many propagators, growers, and researchers are already actively involved in their own way to achieve some of these goals. Landscape architects, as part of the industry, would like to thank them for the endeavours to date.

CONCLUSION

Propagators and growers alike should stimulate a demand for their products by planting the right seeds in the minds of the designers. By creating closer links within the industry, the balance of the supply and demand for indigenous material will be found, and a profitable indigenous plant material industry will be created. By treating the above as a small contribution to the proposed plant propagation development project, the end result may lead to great achievements by the plant propagating industry in the future.

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