APPENDIX 2 - Plant TRAITS and Plant selection rEVIEW

## WHICH PLANT WHERE PROJECT – MODULE 1



The Which Plant Where Project is five-year project is funded through the Hort. Innovation Green Cities co-investment fund. The project is a collaborative partnership between Macquarie University, Western Sydney University, NSW Office of Environment & Heritage, Hort. Innovation and 202020Vision and will facilitate sustainable and resilient urban green space in our cities.

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**EXECUTIVE SUMMARY**

The Which Plant Where (WPW) project is a five-year collaborative project that will develop an online plant selection tool that will create market opportunities for growers by identifying native and exotic species that will be resilient to climate change and enable practitioners to make informed plant selections to future proof our urban landscapes. Further, it will highlight the benefits that urban green space provides for our urban landscapes and how these assets appreciate over time.

The WPW project will create an online plant selection tool that will enable practitioners to make more informed plant selections to support sustainable urban landscapes. The online tool will create market opportunities for growers by identifying native and exotic species in a variety of growth forms (trees, shrubs, herbs, climbers, grasses) that are resilient to climate change, for enhancing urban greening, thereby:

* Facilitating sustainable green cities in a changing environment
* Driving sustainable market growth for the horticultural industry
* Developing tools and resources to be used by a wide range of stakeholders

Throughout the development of the tool, we will continue to work iteratively with stakeholders to implement our research findings in the most productive and usable way. Just as the other modules in the WPW project, the design of the tool will also be grounded on evidence-based research, drawing on literature sources and existing online selection tools.

From the start, our focus was on feedback and guidance from stakeholders, including industry (growers) and end-users (practitioners) of the tool, to understand their needs. Specifically, we wanted to know how they currently select plants and identify new ways in which the plant selection process can be improved. The WPW project ran a series of stakeholder engagement workshops across five states around the country, attracting participants from 86 organisations. Members of the WPW team have also visited grower’s nurseries in Sydney, Melbourne and Hobart to understand the process of delivering quality products to customers, as well as to build contacts that can provide industry advice on the online tool design. Continued consultation will ensure the tool is useful and useable for all parties, contributing to its rapid and widespread adoption.

To start the conversation with our industry contacts, we have compiled a list of design elements and plant traits that seem relevant for the WPW plant selection tool. To construct the list, we:

* Analysed feedback from our stakeholder engagement
* Briefly reviewed site design considerations currently in practice from government guidelines, design textbooks and growers guides (Section 2)
* Reviewed 21 existing online plant selection tools from Australia and around the world to inform the search tool design and identify some possible features that may add to the tool’s utility (Section 3)

Over the next year we will begin to prepare the commercialization plan for the plant selection tool. It is critical that the tool be financially self-sustaining to ensure a high quality of up-to-date data is maintained while keeping pace with dynamic changes in the horticultural industry.

We also view the plant selection tool as an opportunity for increasing the confidence in planting new and under-utilised species, and opening up decision-makers to a wider range of plants that will be resilient in future climates.

**USER-CENTRED PLANT SELECTION TOOL**

To ensure that our research and tools are relevant to the nursery and turf industries, as well as other end-users, the WPW team have engaged with a diverse group of stakeholders via different platforms including stakeholder workshops, industry conferences and nursery site visits. We have taken this approach so the team can gain a deep understanding of the nursery industry (supply) and the design, construct and build industry (demand) for the purpose of developing a fit for purpose tool that will support resilient green urban spaces.

At the beginning of 2017 the WPW project ran a series of comprehensive workshops around the country to promote our project, engage with stakeholders and receive guidance on industry needs. Held in Melbourne, Adelaide, Brisbane, Perth and Sydney, the workshops attracted individuals from 86 organisations, bringing together a diverse group of stakeholders including nursery and turf growers, practitioners, developers, landscape planners and designers, as well as state and local government representatives. The What We Heard document can be found on the WPW website. Participants were asked to discuss in detail the species selection process for plantings in urban spaces, the factors that led to success and failures in urban plantings, current collaborations and the potential for demonstration sites, as well as about the tools and resources used for planting decisions.

Members of the WPW team have also visited nine nursery grower’s sites outside Melbourne, Sydney and Hobart to understand operational procedures, how plants are purchased, who growers interact with, how they deal with demand and to understand how plant species are selected from the grower’s point of view.

The WPW team have set up an Advisory Group that consists of a range of professional staff from horticultural businesses all over Australia to provide industry expertise and advice as we assemble the plant trait database and design the online plant selection tool.

Plant selection decisions for urban spaces are complex and influenced by multiple factors which are dependent on who is making the selection. However, there were consistent themes that arose in every workshop and the most common factors influencing species/plant selection for an urban space include:

* Professional and industry experience
* Nursery stock availability
* Expense
* Ongoing maintenance considerations
* Site location and size - often competing against existing services/infrastructure (e.g. water, sewerage, power lines), the built environment and limited land availability
* Aesthetics such as “order” and/or “uniformity”
* Plant size, shape, form and purpose (windbreaks, shading, biodiversity, health and wellbeing, crime prevention)
* Master plans of a local council
* Current trends and cultural values

Reviewing the feedback from all stakeholders, we came up with some possible ways the plant selection tool can address these barriers:

1. **Have a “*Know Your Site*” checklist to assist decision-makers**

To prompt decision-makers to consider site preparation early in the planning process, the WPW plant selection tool could include a simple checklist of questions about the suitability of the site. Better planning will also promote the use of plants that provide the most benefits to the site.

A successful urban green space is underpinned by adequate spatial allocation to plants, good site condition and preparation. However, many urban planting sites have disturbed soil conditions and competing priorities from grey infrastructure, which may compromise space, light and soil quality available at the planting site. This may be due to blocking of sunlight by infrastructure or disturbances to the soil conditions during the construction phase of the project. Removal of topsoil, soil compaction, flooding, waterlogging or erosion risks may create more challenging growing environments for plants. These issues were flagged by stakeholders almost universally across Australia as a common problem for failed plantings. Stakeholders were aware that these issues can be avoided with better and earlier planning procedures as well as allocation of space and resources to plantings for sites.

1. **Identify the function and co-benefits plants can provide to a site**

Stakeholders were keen to impress on us that the success or failure of an urban green space is not necessarily defined only by whether a species survives or not, but rather if the plants are able to provide multiple benefits for the site. Plants can provide multiple economic, environmental and social benefits to urban spaces and understanding what co-benefits green space has to offer will enhance the overall success of the site. Successful planting may not be only defined by just survival and growth, but also by a range of other requirements such as providing shade, halting erosion or providing habitat for native species. For example, a bank of Lomandra’s planted along a highway may be judged successful because of survival, but unsuccessful for noise mitigation or temperature reduction. This highlights the importance of the plant selection tool to have simple, meaningful and comprehensive measures of key services that plants provide in urban settings, including shade provision, screening, fire resistant qualities, as well as species that are well suited to urban contexts such as street plantings, playgrounds, green walls and carparks. In this way, plantings designed with the tool can better address some of the very specific needs of urban environments.

1. **Identify risks and hazards and maintenance requirements**

A thorough knowledge of plant traits and growth characteristics prior to planting will empower decision-makers to make forward-thinking decisions and provide the best possible plants for an urban green space. Stakeholders raised a variety of issues relating to a lack of forethought and experience in the selection of plants for a particular urban location. For example, issues listed by stakeholders included damage from falling limbs and litterfall, allergenic species or invasive root growth. Concerns were also raised around the capacity for some species to become invasive (weeds) in some parts of Australia (e.g. Perth) that are widely planted in the temperate climates of the eastern states. Furthermore, many species that flourish in wetter, coastal environments would require a high amount of additional care in the many contrasting urban climates across Australia. A clear understanding of the growth strategies of plants (including extra establishment care requirements) will help decision-makers identify the best species and maximise benefits from urban green spaces. By providing growth traits for a wide range of species, particularly those that are under-utilised or relatively new in urban plantings, the tool can direct users to a range of plants suitable for specific urban environments.

1. **Facilitating better multi-species plantings to maximise diversity and resilience**

Green spaces are more resilient to stressors such as pest outbreaks , drought and heat waves when plantings include a diverse range of species and growth forms. Rather than restricting plant choices to just a few suitable plants, we aim to expose end-users to new and under-utilised options, particularly through advising on which plants work well together. Stakeholders consistently raised the need to make better groupings of plants to increase resilience of green space. Planting of monocultures or “blandscaping” were often judged as failed plantings due to a lack of plant succession and biodiversity potential at particular sites, on top of the greater risk of failure from pests, pathogens and environmental extremes. Confusion about correct species groupings amongst bush-care groups and councils, particularly in native regeneration sites was also raised. Modules Two and Three of the WPW project are investigating the benefits of diverse plant communities in green spaces across Australia and will assist in recommending certain plant groupings of species that are known to function well, are resilient and have a low risk of failure as part of the plant selection tool.

**LESSONS FROM THE ‘GREY’ LITERATURE**

The overarching aim of WPW is to change the business-as-usual approach to plantings by increasing the access to, and ease of use, of best practice information. There are already a range of publications suggesting good methodologies to make appropriate planting choices in the urban design and planning literature (commonly referred to as ‘grey’ literature to contrast it with academic journal articles). Advice tends to emphasise the importance of making the right choices at the planning stage, i.e. choosing the right plant for the right place. As part of the WPW project we hope to promote the idea of urban green space creation as a two-way street; just as choosing the right plant is important, sufficient space and resources should be allocated to plantings to maximise the utility of the site. The literature also emphasises the concept of the risks associated with planting certain species in the wrong spaces. We hope to expose end-users to many new appropriate species which meet the requirements of urban sites through clear definition of the benefits of plants and capacity of the site to realise these benefits. The variety of available sources includes guidelines from local, state and federal government, nurseries and growers and from planners and architects, all of which should contribute to the planning of the WPW online plant selection tool design.

Below we provide a brief summary of some of the major considerations by decision-makers when selecting appropriate plants:

1. **The potential for insulating and buffering against environment extremes**

Just as identified by the stakeholder engagement sessions, urban greening can significantly value-add to sites through improving the microclimate and resilience of sites from harsh conditions found in some urban sites. Examples include buffering against extremes of heat, water movement and floods, screens and filters for air, noise, wind and fire severity. Importantly, local heat effects from infrastructure may stress or kill less tolerant plants causing costly planting failures. However, the impact of plants on reducing the impacts of urban heat island effect are well documented and is a primary goal of most urban plantings (Osmond & Sharifi, 2017; Wang, Amati, & Byrne, 2014). In turn,

Stormwater runoff and filtration by plants is an essential part of urban planning and design. Recommendations include planting species that may slow the release of water through the soil underlying urban areas to stormwater stream flow, as well as acting as a physical barrier for surface flow during rain events (Agriculture and Resource Management Strategy Australia, 2000; Beesley et al., 2017). Plants are also a key mitigation measure in erosion prevention both of watercourses and across sloped earthworks (Calkins, 2011; Chang & Collins, 2008).

Air and noise filtration are services required in urban planting zones, particularly near roads and industrial sites. Wind protection can also be a factor for selecting plants in some sites that experienced wind tunnelling from buildings or in coastal and other highly exposed environments (Urban Forest Strategy, 2011).

Plants can mitigate the risk of damage from fire to property through species selection of drought resilient plants with low volumes of litterfall and through planting with appropriate distances from infrastructure (Chladil & Sheridan, 2006).

**Possible plant selection tool features:** Assign ratings to plants based on plant traits that relate to urban suitability, such as shade provision, flooding tolerance, ability to screen noise and filter pollution and ability to mitigate fire risk. Having a diverse list of species will provide many suitable planting choices tailored to the specific needs of sites.

1. **Current practice and advice on how to choose plants**

At a basic level, plants are often chosen for their aesthetic qualities and availability in nursery stock. However, in best practice site designs, the plant should also be selected based on growth form and tolerance limits to meet the physical and human requirements of the site, so that the maximum benefits from urban greening are realised. In some cases, rainfed sites may need to be drought-proofed to remove the need for supplementary watering, particularly when landscaping large areas in low density urban environments (Calkins, 2011). In other cases, supplementary watering may be essential for the survival of plants which greatly improve the utility of a site, particularly in our more densely populated urban areas.

Planting should also take account of the future climate of the site. This issue is growing in importance and particularly relevant for Australia, as climates in our capital cities grow warmer and drier. There is a strong economic imperative for plantings that are resilient to the future climactic changes over the next 50 + years (Davoudi, Crawford, & Mehmood, 2009; Kendal et al., 2017).

**Possible plant selection tool features:** Recommend species based on predicted performance under future climates. This will give confidence to decision-makers to use new or under-utilised species with resilient performance under future climates (see Module Two report with future climate maps).

Planting to match the physical dimensions of the site is often an overlooked consideration. For example, the need to consider planting distances for deep-rooted species away from essential infrastructure. Many government departments have guidelines around the minimum planting distance required from sewage pipes (e.g. South Australia Water, 2016). Measures can be put in place at the time of planting to block problematic surface roots (Mullaney, Lucke, & Trueman, 2015), however ensuring sufficient space and access during the planning and development of a site is crucial. Leaving a restricted space for plants to thrive and provide benefits can result in costly maintenance regimes and loss of potential benefits through plant removal (Chang & Collins, 2008).

**Possible plant selection tool features** Assign clear spatial dimensions such as height and width to all plants to advise the site design process to leave sufficient space for an economically beneficial green space. Recommend plant species that have previously been avoided due to surface roots, which can now be used with proper planting measures.

Good choices also prevent economically costly plant removal and replacement due to the social uses of the site. Plants with high allergenic potential can impose high risk to urban populations and place strain on health systems (City of Sydney, 2015). Plants with poisonous berries or seeds would be undesirable for playgrounds, while a separate suit of plants may create a positive environment for retirement homes (Urban Forest Strategy, 2011). Often, visual access must be maintained for the safety of motorists in roadside plantings, or for easy surveillance in parks and public spaces; planners should consider plants with low undergrowth potential (Bowles, 2013; Chang & Collins, 2008).

**Possible plant selection tool features:** Suggest a wide range of plants that have low allergenic potential, poison risk or undergrowth potential to meet the specific needs of the site.

Efficient and well planned maintenance regimes can begin at the nursery stage and extend through to mature plants (Calkins, 2011). Growers often advise visits to nurseries and assessment of early vigour to improve the likelihood of establishment success (Fleming's Nurseries, 2018). Establishment care of plants during the post-construction phase is critical. This can include a time-tapered schedule of maintenance assessments and which may extend over the lifetime of the planting, as the growth form and plant community change over time; successful plantings are often an ongoing process requiring continued inputs (Chang & Collins, 2008; Department of Urban Services ACT, 2015).

**Possible plant selection tool features:** Present case studies from stakeholders about best practice management for a range of projects in the online selection tool.

1. **The potential for native species habitat improvement**

Native species are often the choice of many local councils because they provide multiple benefits, including contribution to biodiversity, habitat regeneration, and cultural values (Natural Resource Management Ministerial Council, 2006; Nursery and Gardens Industry Australia, 2009). Government best practice programs also consider the genetic stock of local populations when supplying seedling stock to maintain genetic diversity (North Sydney Council, 2017).

**Possible plant selection tool features:** Ensure native species, particularly those currently under-utilised, are promoted by the tool, based on geographic location. Provide links to local council resources and guidelines to source local genetic stock.

**Review of plant selection tools from across Australia and the world**

To construct a useful and comprehensively designed plant selection tool, we conducted a review of current tools in the market place. We reviewed 21 existing web-based tools for plant selection to characterise approaches to their construction and ease of use. This desktop study highlighted the most common elements around the design of search tools and identified effective features which may be suitable for inclusion in the WPW Plant Selection Tool.

There are several online plant selection tools for a range of purposes tailored to specific regions across Australia and the world. Consequently, the design, species and traits of web interfaces vary according to intended audience. For example, websites designed by a government institution in Australia may allow users to filter searches based on supplementary watering requirements, while a nursery plant selection tool from the United Kingdom might be more likely to include plant seasonality as search filters.

We reviewed 15 Australian and six international plant selection tools (Appendix 1 - Online plant selection tools analysed in the review). The creators of these tools included nurseries (9), government/scientific institutions (7) and other commercial entities (5). There were notable differences in the design of web-tools between these groups due to the variation in background, intentions and end-user requirements.

Every search filter from each plant selection tool was categorised and the frequency tallied to determine the most common plant traits (Table 1).



Table - Search filters used to identify suitable plants in 14 online plant selection tools

The search filters themselves could be grouped into four logical categories:

* **Site Environment**, which include categories Climate, Light Intensity, Soil Texture and Plant Tolerance requirements
* **Aesthetics**, including Plant Form, Plant Height, Flower Colour, Seasonal Changes
* **Placement/Purpose**, including Placement, eg Balcony, Street etc., Planting Purpose, e.g. windbreak
* **Planting Risks** including Maintenance requirements, Planting Dangers e.g. Limb dropping, toxicity, thorns, Water-use Efficiency.

**Outstanding website features**

There were several outstanding features from individual sites that improved the user experience and that we think should be noted for the plant selection tool design:

* The websites that functioned best were those which allowed flexibility of choices. You could leave any category blank or select more than one option per category quickly and easily. This allows the user to isolate species that may need to serve multiple purposes, for example a plant may need to tolerate salinity AND frost exposure to thrive at a particular site.

Example: **Morton Arboretum, USA** <http://www.mortonarb.org/trees-plants/search-trees/search-all-trees-and-plants>

* Simple and uncluttered designs dramatically improved the ease of use of many sites. The ability to select as many or as few categories as is required for the purpose and to hide much of the more detailed search bars avoided overwhelming the user with choices. Often just a few search filters may be appropriate for the majority of searches.

Example: **Plant Selector Plus, Australia** <http://plantselector.botanicgardens.sa.gov.au/>

* Presentation and communication of search results also influenced the user experience. Plants were presented with a percentage of how much they matched the criteria selected. This allows the user to make a judgement call on which species is most appropriate, rather than presenting a null search result to restrictive criteria.

Example: **Citree Germany** https://citree.ddns.net/database.php?language=en.

* Providing the list of plants from a search result in a spreadsheet increases the utility of the plant search tool. It allows the user an easily communicable summary which can be shared with others, including growers and other parties in the planning process.

Example: **Plant Selector Plus, Australia** <http://plantselector.botanicgardens.sa.gov.au/>

**Essential website attributes**

Further to the website design there are other aspects of the plant selector tool that will be essential to its success:

* The records and species list that are included in the tool must be current and regularly updated. Lists of plant species that are widely grown are extremely dynamic across Australia and can change rapidly over short timescales, influenced by introduction of new cultivars and changing design preferences. Therefore, new species and cultivars should/must be included in the tool as they appear on the market if it is to remain useful in the coming years. Sites that are run/associated with nurseries performed best in this respect, providing comprehensive growing information to the cultivar level. Examples: **Benara Nurseries, Australia** <https://www.benaranurseries.com/plants>
* The plant selection tool should stimulate users to consider certain aspects of the planting site before making their decision. Guidance on the pertinent issues for planting selections such as choosing a street tree or planting for groundcover was an impressive feature for some sites and could help maximise the utility of the plant tool.

Example: **Bestplants Selection Guide (Ozbreed), Australia** <http://www.bestplants.com.au/>

It is important to place the plants in the context of the site. This could be achieved by providing locations of successful plantings, photographs of the plant *in situ*, as well as lists of plants that are known to grow well with particular plants aesthetically and ecologically. For example, native grasses and Lomandra’s grow well under eucalypts. As part of the broader WPW project which includes plant community and ecology modules, the plant selector tool has a unique opportunity to achieve this.

**Traits and attributes being targeted**

The WPW plant selector tool is a key deliverable of the project’s long-term goal to increase the diversity, liveability, resilience of our cities through urban green spaces. It should be able to not only promote the co-benefits of plants in urban environments but also expose decision-makers to a diverse range of urban suitable species through an understanding of their species traits. So far, information from stakeholders, literature and other plant selection tools have allowed us to put forward some initial design ideas. However, we acknowledge the importance of extensive and iterative consultation with industry and government to ensure the trait list closely matches the needs of the end-users and results in a comprehensive, streamlined and relevant plant selection tool for Australia-wide use.

The end-users of the Which Plant Where plant selection tool will include planners, practitioners and specifiers (e.g. local and state government, transport authorities, landscape architects and developers). The tool will be a decision-support system that enables users to focus on the important steps and questions to ask when prioritizing needs and desired outcomes of a particular space, including factors such as microclimate, urban context and ecosystem services, urban context (transport corridors, open space, housing development) and maintenance.

To begin the conversation about which plant traits should be included in the database, a short-list of potential search filters for the design of the site is presented below. The selection was based on filters in most common use across other selection tools, ensuring a comprehensive array of traits associated with the functionality of plants. However, the proposed search filters have been chosen to clearly characterise the potential risks of plantings associated with many species; failure to take risks into account were the primary reason for planting failure identified during stakeholder engagement meetings for WPW. We hope to suggest a range of new, low risk and future-proof species as well as identify modern alternative ways to manage some of those risks, thereby increasing the confidence in and the diversity of urban plantings.

Some relevant search filters that we have collected data for are:

|  |  |
| --- | --- |
| **Site Environment** | |
| **Climate** | Each postcode could be assigned its own climate level based on Bureau of Meteorology classifications which can be used, in conjunction with light levels, to match to suitable plants. |
| **Light** | A key limiting factor for plant growth in urban sites across the world. For relevance to all stakeholders, measurements in lux units as well as categories of full sun, half shade and full shade should be used. Sorting suitable plants based on site aspect could also prove useful for planners. |
| **Tolerances** | High medium and low tolerances for a range of stresses may be required in certain sites. Possible categories include frost, drought, heat, salinity, wind. |
| **Soil Quality** | A simple category of high medium and low quality, or an indication of whether topsoil is present may be enough to sort most plants in Australia. |
| **Aesthetics** | |
| **Growth Form** | A basic filter universally incorporated into planting decisions. |
| **Plant Height and Plant Width** | These are practical sources of information for planners and can be in ranges e.g. 1 -2 m wide. |
| **Growth Rate** | Useful for judging the rate of plant succession and maintenance requirements |
| **Seasonality** | Evergreen or deciduous classification can determine planting choices based on the needs of the site |
| **Canopy Density** | A measure of the amount of shade from a tree or plant is a desirable trait in most Australian cities and plantings should be judged accordingly. This can be measured using leaf area index (LAI) or using categories (low, medium and high) if necessary |
| **Flower and Foliage Colour** | The aesthetics of the plant are often how plants are selected under ideal planting conditions. |
| **Site Context** | |
| **Placement and Function** | Purpose of the plantings are highly relevant to the decision. It should be possible to select multiple categories so that multiple purposes can be met by a single species. |
| **Place of Origin** | Distinguishing plants as either native or exotic in origin allow the users to choose plants that can play a role in ecosystem services and potential native habitat. |
| **Ecological Services** | Examples include bird attracting or a source of pollen for bees. Native plants and plants with ecological services are important traits in plantings as native species and habitat preservation which are preferred by councils Australia wide. |
| **Planting Risks** | |
| **Maintenance Requirements** | are identified by stakeholders as a primary reason for failed plantings across Australia and although not commonly found in existing plant tools, should be a key filter in the Which Plant Where Project. |
| **Possible dangers** | incorporating unfavourable characteristics are crucial for a successful planting. Risks include invasive root growth, thorns, allergenicity etc which can be converted into ratings of 1 to 5 for ease of use. |
| **Water-use efficiency** | Australia’s climate is changing in many areas to more frequent and more severe droughts. The water use efficiency is already a key feature for most planting sites across Australia. |

**NEXT STEPS**

**DESIGN, DEVELOPMENT AND COMMERCIALISATION OF THE PLANT SELECTION TOOL**

The last part of the WPW project includes the development of an interactive online tool to inform species selection for green spaces across Australia under current and future climates. Initial ideas for features included in the tool included;

* Maps of the distribution of suitable habitat for species under current and future climates
* Filters for specific needs of different urban plant strategies (built environment, WSUD, urban forests and roads and transport corridors)
* Incorporation of risk flags in relation to limb drop and potential infrastructure conflicts.

The team will work closely with end-users to explore and ideate the online tool through:

1. **Stakeholder engagement workshops** – workshops aimed at end-users, including participants such as growers, planners and practitioners for urban greening with the aim of gaining a deep understanding of the opportunities and current unmet needs.

2. **Design-thinking and shadowing –** using design thinking and shadowing techniques we will co-design the plant selector tool by understanding the customer journey, how people make decision for plant selection and how we can enhance the process with our online tool.

3. **Design –** The systems architecture, user workflows, layout, key features and functions and branding will be an important part of the tool. It is expected that we will work with 202020Vision regarding their support in this space.

4. **Develop business model and commercialisation plan** – To keep the online tool a live website it will be important to develop a commercialisation plan so a competitor analysis, possible revenue streams, cost structure and key partners will be incorporated into this plan.

**APPENDIX 1 -** Online plant selection tools analysed in the review



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