

CAN TECHNOLOGY PROMOTE TREE VALUE?



Author - Mark Hooper Level 4 Advanced Arborist

Supervisor - Rob Graham

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Summary

Abstract

This research report investigates the development of a Universal Tree Valuation (UTV) method aimed at standardising tree value assessments across global jurisdictions. The study outlines the creation of a robust, defensible valuation framework that integrates current methods into a consistent scoring model. To enhance usability and accessibility, the UTV method is implemented within a custom designed smartphone application platform, enabling arborists, councils, potential industry partners and the public to conduct field based valuations efficiently and accurately. The research includes a review of existing valuation systems, stakeholder engagement, development and iterative testing to refine both the method and the app interface. Findings suggest the UTV approach offers a transparent, user friendly, and scalable solution for consistent tree valuation across regions, with potential to inform urban planning, conservation efforts, and insurance assessments. Wider applications into new insurance products are discovered as well as potential for the further development of the App. The wider hypothesis of this research is to discover if a technological advantage can be gained providing a more available and accessible valuation process, thus allowing a larger cross section of the community a perception of 'value', even if solely monetarily.

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Introduction.

The concept of “value” is as multifaceted as it is subjective. Defined by *The Concise Oxford Dictionary* as worth, desirability, utility, and the qualities upon which these depend, value is often interpreted differently depending on context and perspective. When it comes to trees, these complexities are magnified. How do we begin to quantify something that serves ecological, aesthetic, cultural, and even emotional functions? What makes one tree more valuable than another, and who decides that value? One person’s cherished specimen may be viewed as a nuisance by a neighbour due to falling leaves, obstructed views, or root encroachment. Despite these challenges, there exists a growing necessity to assign a quantifiable value to trees, whether for urban planning, legal disputes, or asset management.

To address this need, a plethora of tree valuation methods have been developed across the globe, each with its own methodology, assumptions, and cultural context. Prominent among these are CTLA (Council of Tree and Landscape Appraisers) in the United States, STEM (Standard Tree Evaluation Method), MIS506 in New Zealand, Burnley in Australia, and CAVAT from the UK. These systems assess value based on attributes such as amenity value, size, condition, location, and estimated replacement cost. However, these methods are not without flaws. They often rely on cumbersome, paper based forms, subjective judgments, and can produce inconsistent results, particularly when applied across different regions and environmental conditions. Moreover, the lack of standardisation makes comparisons difficult and undermines the credibility and utility of tree valuations in high stakes contexts such as litigation or urban development. We, as Arborists can become wilfully blind to this inaccuracy, as the parameters and interpretations of the various methods, in isolation are understandable, meaningful and reasonable.

At a time when modern arboriculture seeks to elevate the status of trees for their social, environmental, cultural, and economic benefits, the tools used to measure those benefits have not kept pace with technological advancements. The majority of current valuation systems remain analog and fragmented, presenting a major barrier to efficiency and accessibility, particularly for those working in the field. Meanwhile, the proliferation of smartphones and digital tools presents an enormous, largely untapped opportunity to modernise the way tree valuation is conducted.

This research explores the development of a Universal Tree Valuation (UTV) system, embedded into a smartphone application designed to digitise, consolidate, and streamline the process of tree valuation. By borrowing from existing global methodologies and embedding them into a user friendly digital platform, the app aims to increase consistency, reduce human error, and drastically improve usability for professionals and non specialists alike. The app is envisioned to incorporate features such as photographic and geospatial inputs, integration with device tools like clinometers and rangefinders, and real time calculations based on preloaded valuation formulas. These capabilities could enable faster, more reliable assessments while opening the tool to broader users, including insurance loss adjusters, landscape planners, and city councils.

This project stems from previous academic work investigating the application of STEM, CTLA, Burnley, and MIS506 now known as AANZAA-Value/25 methods to a sample set of 15 trees.

That research highlighted two major limitations: the wide variation in results produced by different systems and the outdated processes used to conduct evaluations. These insights formed the basis for the UTV concept, a hybridised, technology enabled approach that could help standardise tree valuation while preserving flexibility to accommodate local and cultural valuation priorities.

The purpose of this research is therefore twofold. First, to evaluate whether a universal method, an aggregate or weighted average of existing systems, could be established and adopted across jurisdictions. And second, to assess the feasibility of creating a digital platform that can house multiple tree valuation systems, including UTV and deliver consistent, accurate results. Through engagement with arboricultural experts, IT developers, and potential end users, this project seeks to explore both the theoretical foundations and practical applications of this idea.

Ultimately, this research aims to contribute to a more efficient, accurate and credible future for tree valuation, one that reflects the true worth of trees in our rapidly urbanising and ecologically stressed world. In consequence, the elevation of the perceived value of trees can only be beneficial.

Aim - Purpose.

The primary purpose of this research is to explore the development of a Universal Tree Valuation (UTV) system, one that is globally applicable, scientifically grounded, and technologically enabled. The project seeks to address long standing inconsistencies in tree valuation by integrating established methodologies into a unified, digital platform that enhances usability, accuracy, and accessibility. At its core, this research is driven by the recognition that current systems, while useful in their own contexts, are fragmented, manually intensive, and prone to error or misinterpretation. By creating a cross platform smartphone application capable of delivering valuation outputs based on a hybridised model, this project aspires to modernise the practice of arboricultural assessment and extend its reach to new professional domains such as insurance, asset management, and urban planning. In essence, the elevation of tree 'Value' is the desired purpose of this project, by means of making an accurate tree appraisal accessible, efficient and available for a larger portion of the population.

The project also aims to address the broader question of whether a universal approach to tree valuation is possible, or even desirable, within the diverse global context of arboriculture. By borrowing elements from respected valuation systems such as CTLA, STEM, Burnley, CAVAT and MIS506, and layering them into an intuitive, digital interface, the research explores the possibility of generating a consensus driven model that could be accepted across jurisdictions. This includes investigating how such a system might manage the balance between objective measurements (such as trunk diameter, condition, or form) and subjective values (such as cultural significance or aesthetic impact).

In practical terms, this research will examine the viability of developing an app that can house multiple valuation models, automate data collection, analyse, and provide clear, auditable outputs. It also seeks to undertake market research and identify potential barriers to implementation, such as legal or intellectual property constraints, and explore how these might be overcome through thoughtful design and stakeholder engagement.

Research Aims

1. To critically evaluate existing global tree valuation methods, including STEM, CTLA, Burnley, MIS506, CAVAT and others, and identify commonalities and limitations that could inform a hybridised model.
2. To conceptualise, design, and prototype a smartphone application capable of supporting multiple valuation methods, including geospatial mapping, photographic documentation, and in-app measurement tools.
3. To test and refine the prototype through real world trials, evaluating its accuracy, efficiency, user friendliness, and applicability across various sectors including arboriculture, insurance, and urban asset management.
4. To propose a framework for a universal tree valuation method, based on an average or weighted synthesis of existing systems, that could be recognised by professionals across national and regional boundaries.
5. To assess the feasibility and cost of bringing the UTV app to market, including potential partnerships, funding opportunities, and the identification of key user groups and distribution channels.
6. To contribute to the professional discourse on the future of tree valuation, offering recommendations for integrating digital valuation tools into mainstream arboricultural practice and urban decision making processes.

Methodology

This research adopts a mixed methods approach combining qualitative evaluation of existing tree valuation systems with quantitative field testing and data analysis to develop a prototype Universal Tree Valuation (UTV) model. The overarching aim is to determine whether a hybrid model based on the averaged outputs, or weighted value outputs of selected valuation methods, can offer a more consistent, accessible, and globally acceptable approach to valuing trees.

1. Selection of Valuation Methods for Analysis

Four widely used tree valuation systems will be selected for detailed comparison and analysis: These systems will be chosen due to their popularity, regional influence, geographical distribution, established methodologies, and availability of documentation. Each method includes different valuation parameters such as trunk size, species desirability, health, amenity value, form, and location. The diversity among these systems offers a robust basis for comparative evaluation and synthesis.

2. Data Collection

Fifteen tree specimens of three different species (5 x 3) will be selected across multiple urban and suburban sites around Christchurch. Selection criteria will ensure variation in:

- Species
- Size and age
- Health and structure
- Functional or amenity value
- Environmental context (e.g. parkland, residential, roadside)

Each tree will be evaluated independently using all four valuation methods. Standardised data will be collected, including:

- Photographs
- Location
- Trunk diameter and height
- Canopy spread
- Form
- Vigour

Data will be entered manually ensuring consistency across valuations.

3. Comparative Analysis of Valuation Outputs

The resulting monetary values for each tree from all four methods will be tabulated and statistically analysed. This step will,

- Identify the valuation range and degree of variance between methods
- Detect systematic biases or weighting differences
- Reveal any outlier tendencies in particular methods

Quantitative methods such as standard deviation, mean, and median value comparisons will be used to interpret valuation dispersions. This analysis will guide the development of a weighed or averaging strategy for the Universal Tree Valuation.

4. Development of the Universal Tree Valuation Formula

Based on the comparative analysis, a Universal Tree Valuation (UTV) formula will be created. This will take one of two possible forms:

- Unweighted Average: An equal average of the values produced by the selected systems
- Weighted Average: A proportional average based on regional usage.

The formula will be tested to ensure that it delivers realistic and defensible outputs that fall within the logical range of the individual methods while reducing extreme variance.

5. Prototype App Integration

The UTV model will be embedded into a smartphone application prototype or User interface. The app will include,

- Preloaded formulas for each method
- Input fields for trunk diameter, health, form, location, species, etc.
- Built in tools for photo capture, GPS tagging, and basic measurements.

- Automatic calculation of individual and universal tree values

The app interface will be designed to allow users to view valuations from each method and the Universal Valuation concurrently for transparency.

Gather informal user feedback.

6. Market Research

This market research strategy aims to validate demand and guide the development of the Universal Tree Valuation (UTV) smartphone app by identifying key user groups, such as arborists, councils, insurers, and developers. It will explore the potential to expand the market within the Tree care industry and adjacent industries and regulatory bodies currently requiring Tree appraisals. Explore novel market opportunities. These may include, home owners, Landscape Architects, Insurance loss adjusters etc.

7. Legal and Intellectual Property Considerations.

An investigation into the Legal, Intellectual Property and Privacy issues that may arise as a result of the UTV App platform development.

Results

1. Selection of Methods of Evaluation.

During March and April of this year, data was collected for a separate assignment investigating Advanced Tree Valuation (ARBO606). This data is relevant and recent and will give clarity on the various flaws and attributes of the current methods of valuation. Four Methods have been selected as the basis for the UTV hybrid system. This selection was based on popularity of the systems in the country of origin as well as the cross section of attributes required for evaluation. Also, a geographical spread was considered desirable. Precedence in legal, regulatory and municipal applications also gave weight to the selections.

These Four systems are

- STEM (Standard Tree Evaluation Method – New Zealand)
- CTLA/ISA (Council of Tree and Landscape Appraisers – USA) Shortened to CTLA.
- Burnley Method (Australia)
- CAVAT (UK)

MIS 506, now further developed and known as AANZAA-Value/25, was excluded from the selection for no specific reason other than a Geographic imbalance. In essence, it appears that the development of the AANZAA method was founded on the same frustrations of this research. Whereas, this research is seeking to develop an average of several methods, AANZAA draws from several of the same methods to create its parameters. The transfer of formula and values from the Excel format to the App platform also provided some trepidation. AANZAA is considered inspirational to this research project as it utilises digital technology and provided the impetus for technological expansion to a smart phone App. The AANZAA method does provide a distinction in land use value ie; between public and private trees which is missing in depth from the other methods, with only CAVAT using a population density multiplier. It also concentrates on the attributes of the tree, not the flaws and considers a trees true value as being one of Amenity/Socio-ecological value.

CAVAT, CTLA, STEM, and Burnley are ideal contributors to a UTV (Universal Tree Valuation) hybrid model because each captures a distinct and valuable aspect of tree worth. CAVAT, developed in the UK, emphasises the public amenity value of trees, factoring in visibility, access, and community benefit, making it ideal for urban and roadside trees. In contrast, the CTLA method, widely used North America, brings a market based, legally defensible framework grounded in replacement cost, making it highly suitable for insurance claims, litigation, and real estate disputes.

STEM, commonly used in New Zealand and Australia, offers a transparent points based scoring system that evaluates condition, amenity, and ecological function, allowing for consistent application across a variety of tree types and contexts. The Burnley method, developed in Australia, contributes a context sensitive approach, incorporating urban forestry principles and assigning value based on local environmental and aesthetic importance. Together, these methods provide a well rounded valuation system. CAVAT for civic benefit, CTLA for economic clarity, STEM for scoring

consistency, and Burnley for ecological nuance. This mix enables the UTV model to be both globally applicable and locally responsive.

2. Data Collection.

A selection of 15 trees will be used for evaluation using the 4 methods expressed above. This will comprise of 5 individual trees of three species (5 x 3). The species to be evaluated are London Plane (*Platanus x hispanica*), Totara (*Podocarpus totara*), and Camperdown Elm (*Ulmus glabra Camperdownii*). Tree selections were made to represent diverse commonality, frequency, stature, health, form and origin.

Three of the methods selected for the UTV hybrid system were used as part of the earlier study, with the CAVAT values added afterward. The CAVAT values were calculated on the LTOA site calculator which proved difficult to capture the data, so only final values are included. CAVAT 'Quick Method' was used.

'Advanced Tree Valuation' will be made available as an appendix to this report.

TREE ID	BURNLEY	CAVAT	CTLA	STEM
ELM #1	\$4541	\$15793	\$12800	\$23732
ELM #2	\$8930	\$67059	\$50900	\$27156
ELM#3	\$10047	\$64183	\$49800	\$23970
ELM #4	\$487	\$5962	\$33800	\$18410
ELM #5	\$14951	\$124049	\$69000	\$25931
PLANE #1	\$1503	\$1363	\$1300	\$9915
PLANE #2	\$12738	\$145355	\$108500	\$31154
PLANE #3	\$18613	\$161069	\$108500	\$31891
PLANE #4	\$5239	\$127675	\$57300	\$29312
PLANE #5	\$5182	\$14538	\$7100	\$21857
TOTARA #1	\$3127	\$2384	\$4800	\$16547
TOTARA #2	\$14248	\$56254	\$41500	\$22745
TOTARA #3	\$22327	\$212702	\$103000	\$32953
TOTARA #4	\$13008	\$76747	\$33100	\$24219
TOTARA #5	\$3518	\$10811	\$11700	\$17934

3. Comparative Analysis of Valuation Outputs.

GENERAL OBSERVATIONS.

- CAVAT and CTLA tend to give the highest valuations, especially for larger or high value trees.
- Burnley consistently reports the lowest valuations.
- CAVAT often produces very high valuations, particularly for Plane and Totara trees.
- Plane trees have the highest average CAVAT and CTLA values, likely reflecting large size or public amenity.
- STEM values remain moderate across all species, showing consistency.

METHOD-SPECIFIC OBSERVATIONS.

- Burnley - Shows low variability and often undervalues compared to others. Especially low for ELM #4 (\$487) and PLANE #1 (\$1,503).
- CAVAT - Shows very high variance; highest value is \$212,702 (TOTARA #3). May over inflate values for large or prominent urban trees.
- CTLA - Tracks closely with CAVAT but slightly more restrained. High for ELMs and PLANEs, particularly ELM #5 (\$69,000) and PLANE #3 (\$108,500).
- STEM - Provides moderate, consistent values across all species. Less volatility, suggesting conservative valuation.

OUTLIERS (Significantly Different Valuations).

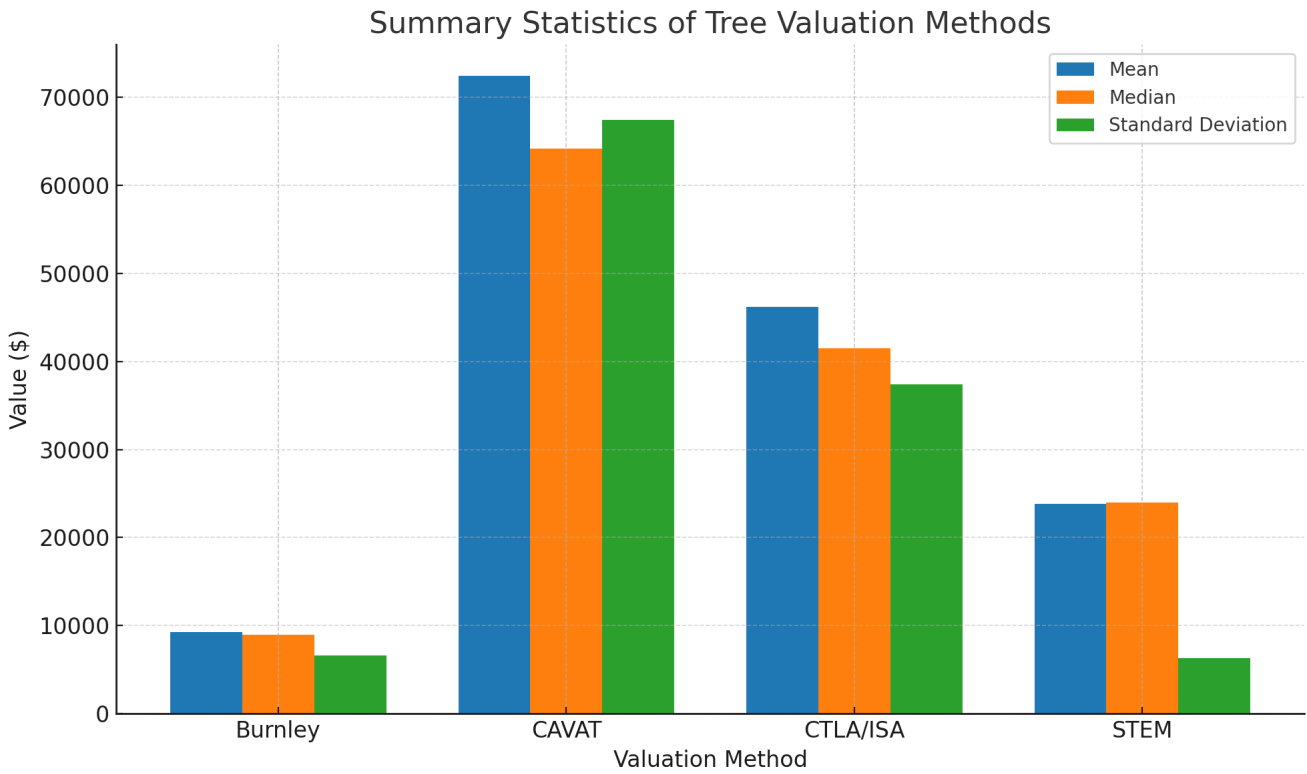
- TOTARA #3 - CAVAT: \$212,702 vs Burnley: \$22,327 — major discrepancy.
- ELM #4 - Burnley: \$487 vs CTLA, \$33,800 — Burnley dramatically lower.
- PLANE #2 & #3 - Burnley vs CTLA/CAVAT differ by over \$100k.

CONCLUSIONS.

- Burnley provides the lowest and most conservative valuations, perhaps suitable for insurance baselines.
- CAVAT and CTLA can inflate values significantly, reflecting public amenity or functional value.
- STEM offers a balanced and consistent approach, but may under-represent high-value public trees.

GRAPHS

1. Showing Mean, Median and Standard deviation.



Interpretation

Mean vs Median

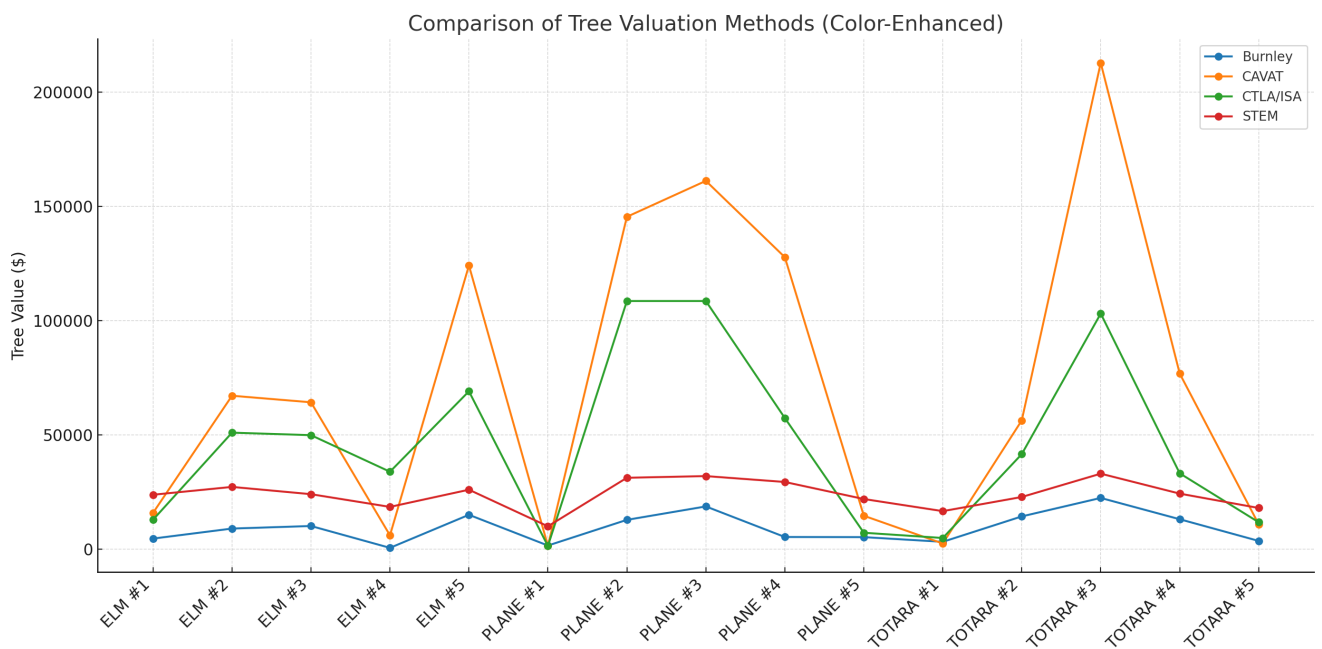
- Burnley and STEM show very close mean and median values - their distributions are relatively symmetrical and consistent.
- CAVAT and CTLA/ISA have significantly higher means than medians, suggesting a right-skewed distribution with extreme high values (outliers) pulling the mean upward.

Standard Deviation (SD) – Dispersion

- CAVAT has an extremely high SD (\$67k), indicating massive variability—some values (like \$212,702) are far beyond the norm, which may undermine trust in the method's reliability.
- CTLA/ISA also shows high variability, though less extreme than CAVAT.
- Burnley and STEM have much lower SDs (\$6.3k–\$6.5k), meaning their valuations are more stable and predictable.

Graph 2. Showing bare accumulated data from the 4 systems in survey.

The graph below gives a good representation of the nature of each system with STEM and Burnley being somewhat conservative and narrow in their values, while CAVAT and CTLA seem more volatile and reactive.



4. Development of the Universal Tree Valuation Formula.

The need for a Universal Tree Valuation method is twofold. Firstly, a globally recognised and accepted method is worth pursuit, as the plethora of current systems and methods possibly delegitimise the valuation endeavour. With so many, usually, regional systems in place, the industry is at a loss to adequately account for the accuracy of the method in use. This also effects trust in the system as well as the industry. It could be argued that the introduction of UTV is just adding another system to the mix, thus adding to this problem, which is worth exploration. The difference being with UTV is that it borrows from the systems in place, rather than adding to them, attempting to harness the attributes of each system while reducing the volatility of others.

The second issue this system seeks to mitigate is one of consistency. As the data set so graphically illustrates, the range and depth of disparity within the systems is a glaringly obvious problem. Perhaps it is one we, as Arborists are even slightly more blind to. We can see the attributes each system relies on for its judgement, and in many ways, in isolation they make good sense, but to adjacent industry, legal entities, insurance adjusters, planners etc the current valuation regime must seem farcical.

A Universal Tree Valuation (UTV) model, particularly one built transparently and based on empirical data, would add significant legitimacy to tree valuation. It has the potential to standardise practice, increase public and institutional trust, and elevate the professional standing of arboriculture.

UTV Average vs UTV Weighted average.

The formula for the UTV system will be either a pure average of the values of the four systems with each system adding equal weight to the average. The UTV Weighted average will be calculated by acknowledgment of the popularity of the systems used. That is, the weighting will reflect the current user profile of each system and assign a percentage weight to that system.

In deciding on the weighting, data and evidence of the popularity was difficult to attain. Various search engines and AI systems were used to try and get usable data and reliable information around numbers of valuations commissioned globally and the relevant numbers associated with the various systems. Numbers were aggregated as follows,

ISA Certified Arborists 57,000 globally as per ISA Annual Report 2023. This makes up a small number of overall Arborists around the world, perhaps 10 -15% are ISA Certified. TCI Magazine puts the number in 2022 as 289,000 in USA. According to Careers NZ around 1614 Qualified Arborists were working in 2018.

Estimates based on these numbers put those employed within the Arboricultural industry at around 500,000 - 600,000 globally as of 2025. Of these approximately 5 - 10% fall into the Consultant category, or those adequately qualified or competent to carry out appraisals. This equates to around 25,000 - 60,000 Consultants who on average conduct 3 appraisals per year 75,000 - 180,000. Of these approx. 50% are CTLA, 30% are CAVAT 15% are Burnley and 5% are STEM. The difficulty in getting accurate data is frustrating mostly due to the niche nature of the valuation practice as well as the variation in what can be considered a valuation, ie; formal and informal. This frequency of specific systems informs a weighting based on the percentages expressed above,

CTLA 50%

CAVAT 30%

Burnley 15%

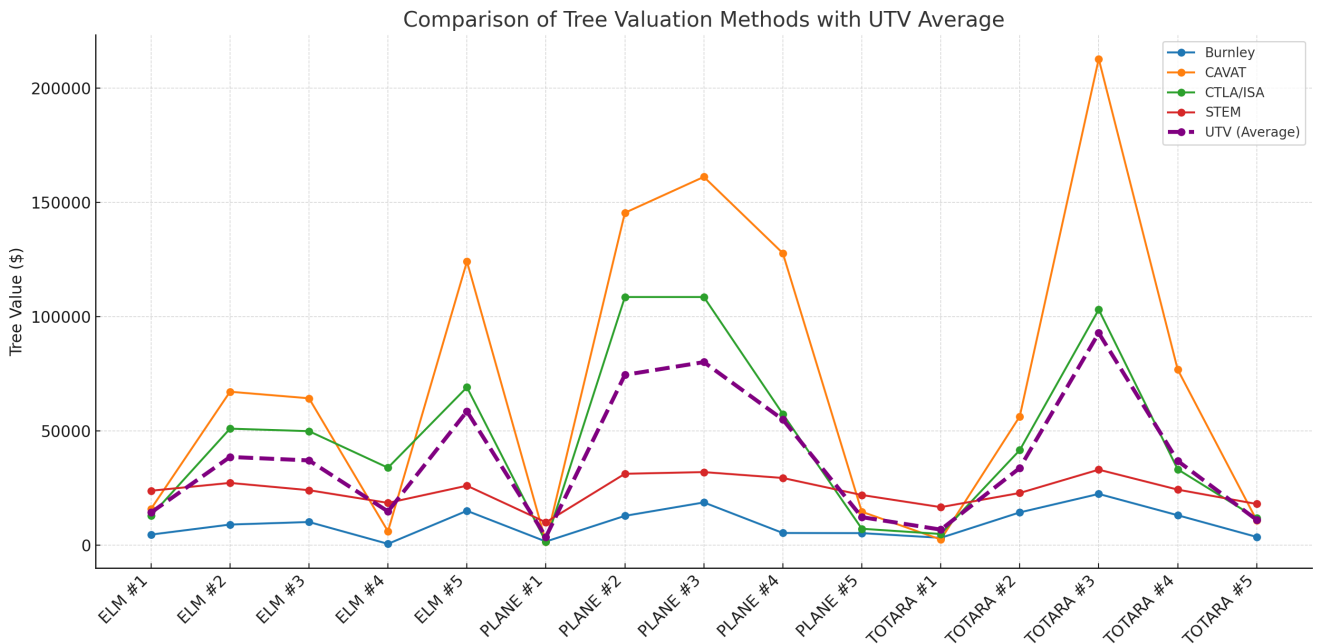
STEM. 5%

The graphs below illustrate the UTV Average and UTV Weighted Average.

Graph 3 - Below - Showing un weighted UTV Average.

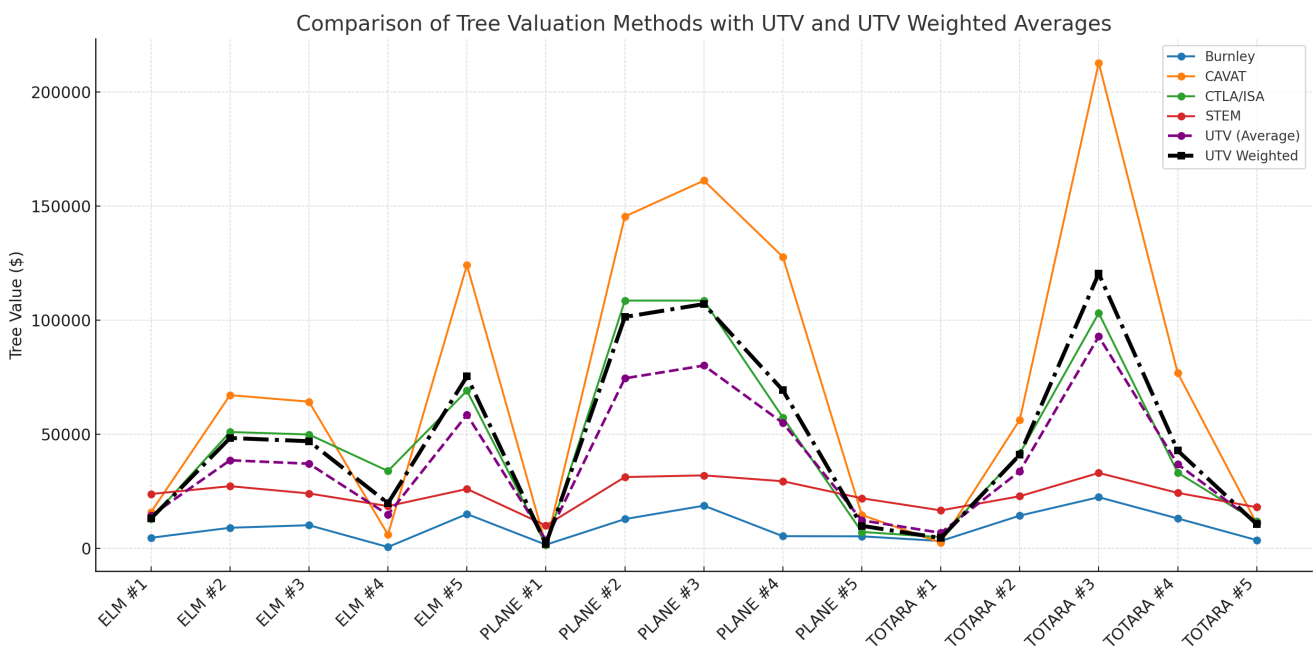
UTV (Universal Tree Valuation) average shown as a purple dashed line. This line represents the mean value of all four methods for each tree, giving you a balanced indication of overall tree worth.

As can be seen, the UTV average allows for the elevation of larger specimens or trees of significance, without the volatility associated with CTLA and especially CAVAT. However, the average does not reflect the overall user profile of each system. For example STEM and CTLA carry the same average weight even though CTLA is used approximately 10 times as often, if not more.



Graph 4. UTV Weighted Averages included.

As the graph below illustrates, the UTV Weighted Average (in Black) follows very closely the CTLA path, as can be expected. The average is weighted 50% towards CTLA, which also sits below the more sensitive and volatile CAVAT scores. The volatility of CAVAT still pulls the weighted UTV average above or below the CTLA line, but generally provides a more rational valuation.



Positive attributes of a UTV Weighted Average

Balances realism and value - Doesn't undervalue trees like Burnley, nor overstate them like CAVAT.
Responsive to real world significance - High value trees remain high, but within a rational range.
Professional credibility - Provides a transparent formula, ideal for reports, dispute resolution, and urban planning.

Limitations

Still reflects underlying method biases e.g., CAVAT's urban bias or CTLA's commercial valuation basis.

Weightings must be evidence based or peer reviewed to be fully defensible.

Lack of usable data on popularity of systems is problematic.

Results mirror closely with CTLA, bringing questions of necessity.

Burnleys Base value calculation is tedious and ambiguous.

Conclusion

The UTV Weighted Average system shown is a strong candidate for a standardised, balanced, and defensible valuation model. It maintains sensitivity to tree value drivers (public amenity, structure, condition) while reducing excessive fluctuation. Its inclusion could enhance professional trust and decision making balance.

However, the values represented by the UTV weighted average, closely mirror that of CTLA. This brings into question the necessity of the UTV system. If anything the additional data entry required to get a result that is largely similar to that of an already established system seems somewhat pointless. It could be argued that the additional data required for UTV would be nullified by the utilisation of the UTV App and that the additional data would better represent a balanced appraisal. At the very least, the analysis can conclude that, of the established current valuation methods, CTLA best represents a system that closely aligns with a weighted average of the 4 most popular current valuation models and UTV Weighted Average would best represent a system that balances the attributes and flaws of the same four systems.

The collection of the 4 methods of appraisal is also debatable. The tedious and somewhat ambiguous nature of the Basic Cost calculation of Burnley adds to inaccuracy. AANZAA/Value 25 would likely better represent a more holistic set of parameters without the need for nursery specimen base value calculations.

5. Prototype App integration.

For better or worse, the Smartphone has become almost a permanent attachment to most human beings of the 21st century. Its influence on productivity, culture, leisure and indeed life borders on revolutionary to the point of evolutionary. While the pros and cons of smartphone technology can be debated endlessly, the use of applications or Apps form the platform of this research.

A Universal Tree Valuation App would take full advantage of a smartphone Apps portability, computational power and onboard location and measurement tools.

Information technology as an industry is well removed from Arboriculture and as such, the author of this research will require large input from IT industry experts to gain an insight into the development and design of a smartphone App.

4-05-2025. I emailed a Digital media company called Elegant Media, who called to discuss the design and build process. I spoke with David for nearly an hour to get as much information about the process as possible.

On first light the theory of an App that uses established tree valuation systems and formula to calculate value is considered easy and would not be difficult to build. The difficulty comes in trying to establish the cost of the build and the market for the App once developed. This will be explored in later sections.

-Elegant Media were unable to supply an estimate based on the brief I had given outside of a ball park figure of between \$10k and \$100k.

27-06-2025. It was suggested by my brother in law, to utilise a freelance forum like UpWork or Freelancer, these sites allow freelance IT professionals to bid on a project. A brief description of the Apps user interface is required and a monetary budget expressed, then freelance IT professionals from around the world bid on the project. They can ask questions to gain a better understanding of the project and offer testimonials and portfolios of previous work. I uploaded a brief synopsis of the project and a budget guided by the site suggestion of \$3 - \$5k. This gave me dozens of offers to build the App from freelance IT professionals from around the world. I replied to two builders, one in Australia and one in USA. The Australian App builder Nikhil asked for more information which I offered and his estimate for the entire App build was around \$20k. The American programmer asked for more details and seemed to have already investigated the valuation process, asking if I was going to use established systems like CTLA. I responded that this was correct along side other systems. He seemed to think it was an easy build and didn't question his bid of \$4k. So, somewhere between \$4k and \$20k is the likely professional freelance IT build cost.

10-07-2025. I also gained wisdom from a friend in USA who runs an IT and ISP company. He also suggested I utilise freelance App builders. My friend (Daniel) also had two key pieces of advice beyond this,

"1. Describe the requirements in "Plain English". When we create requirements we write "user stories" - i.e. "I am a homeowner and I want a valuation of a tree. I open the app and I click on the button "start valuation", I select the species from a drop down, select the age from a drop down, select the condition from the drop down, and click "submit"... If there are different users (e.g. a 'homeowner' or 'admin' (the person who manages the app), you should create user stories for each to them. This will be very valuable for you to understand exactly what you want. And there's no need to get technical in

the user stories, that's not your job, it's the developer's job to figure out how to turn your concepts into reality."

"2. Only hire developers who specialise in App development. When you post a job you'll get responses and you'll be able to see the developer's work history. You should only hire someone who has 90% of their work in App development... you'll get people who have done 10-20% app development, and the rest of their work is all over the map... that's a key indicator that they don't really know what they are doing, and if they aren't a specialist in a specific area, you won't get good work.

The design and planning part of a project like this is probably the most difficult. Once you have a clear roadmap of what you want, the building should be relatively straight forward (like having detailed blueprints to build a house)".

This is valuable advice, which I intended to take. For not only the reasons Daniel stated, but also as I intend to research the potential market and offer the App to an expanded market place without committing to an expensive full App Development and build.

13-07-2025. I then followed an Ad on Youtube which led me to an intuitive AI App building site called Base44. I was initially very skeptical as the claim of the site was to turn your ideas into an App using plain English. The site uses an AI engine to write the code based on your plain English prompts or instructions. The first prompt was to build a platform for a tree value calculation App, using established methods to include CTLA, CAVAT, STEM and Burnley. Within a few minutes it had produced a basic working user interface which followed a reasonable sequence of inputs to land on a value. The initial valuation was wildly incorrect, but subsequent prompts and inputs have allowed me to create a working prototype that is closer to 75% usable and accurate.

As at 19-07-2025 the user interface prototype is functional and accurate, using inputs from the field to gather information as well as using the smartphone on board tools to GPS map the tree and the camera and incline tool to calculate height.

The App user interface and function is best demonstrated rather than described, so a presentation of the App will accompany this project.

Beyond the development of this current App idea, I foresee advancement in a digital valuation App such as this. I imagine AI (Artificial intelligence) will allow an incredible array of powerful measurement tools. I can imagine the possibility of an App that would simply require a photograph of the tree to be appraised, and the AI would do the rest. It could, identify the tree species (already reliable Apps are able to do this), use emerging LIDAR technology to measure the tree (height, canopy spread and trunk diameter), globally position the tree (population density, visibility, position) and even scour the internet for nursery specimen to gain base values. Then calculate in the background using the desired valuation method.

6. Market Research

Based on global arboricultural employment, as expressed above, estimates of 500,000–600,000 professionals in 2025, the potential user base for the Universal Tree Valuation (UTV) app is both niche and highly specialised. ISA Certified Arborists number approximately 60,000 globally (as of 2021), representing only 8 - 10% of the total arborist population, indicating a broader market of uncertified but active professionals. In the U.S. alone, TCI Magazine reported 289,000 arborists in 2022, while New Zealand had 1,614 qualified arborists in 2018, highlighting both market saturation in larger countries and growth potential in smaller, regulation heavy markets.

Focusing on the consultant segment, estimated at 5–10% of the industry, reveals a core target group of approximately 25,000 to 60,000 professionals globally who are qualified to perform formal tree appraisals. These consultants are key end users of the UTV app due to their involvement in valuations for development, insurance, legal, or council reporting purposes. With an estimated average of 3 appraisals per consultant per year, the app could support between 75,000 and 180,000 valuation events annually. Of which, a reasonable market share would be 5 - 10%.

This quantifies a small, infrequent and very niche market for the UTV platform within a technically skilled, compliance driven subset of the tree care industry. While relatively small in volume, the market is high in strategic value, given that these consultants often influence purchasing, policy, and urban forestry decisions. The UTV App would offer these consultant professionals a valuable tool that could significantly improve efficiency and value. Even with a focused marketing approach targeting this segment, especially in countries with strong arboricultural certification frameworks, a path to early adoption and long term scalability remains unclear and likely unprofitable. Beyond this though, it is envisioned the App will be highly user friendly which could expand the reach of the end user within the TCI. This would mean a less qualified user could be employed to gather appraisals with oversight.

The UTV App also lends itself to the inclusion of appraisals in Arborist consultation documents previously not included. It is envisioned a UTV appraisal could become a standard inclusion in a VTA (Visual Tree Assessment) as the process provided by the UTV App would efficiently enhance the VTA consultation and documentation. It could also be envisioned that the UTV App could provide a supplementary platform for gathering data for the VTA document integrating the appraisal automatically.

Beyond the tree care industry, the App would also transfer to adjacent industry professionals who require Tree appraisals such as Landscape Architects, Municipal and Council planners, Urban Developers even Real Estate professionals. The potential market for expansion into these areas is difficult to calculate.

Expanding market horizons beyond TCI and adjacent industries could uncover potential markets and products that may be directly attributed to the UTV App. For instance, the Insurance industry. A quick search engine investigation reveals an absence of any form of Domestic Tree insurance. Commercial forests have long been able to be insured for fire due to an agreed market value of the trees at harvest, but not domestic or urban ornamental trees.

Luckily, the Author has a friend in the Insurance Industry who was available for discussion on this.

Tony Boon is Head of Claims Operations at Ando. He also investigated the absence of this form of insurance, and agreed this was largely attributable to the inability to gather an agreed valuation on an established or mature tree. We discussed the UTV App and agreed this would make the process efficient and also uniform. Discussion soon turned to writing policy and application. Tony considered 'Domestic Tree Insurance' could sit well in a suite of policies for 'High Value' customers, as an addition to a Home and Contents policy.

Tony provided a draft Policy wording as follows,

Domestic Tree Insurance – Draft wording Based on being an optional cover under a Homeowner's policy

"Specified Tree Cover" Insurance Option

Protect the significant trees that enhance your home's landscape and value with tailored insurance for individual specified trees, supported by a certified Universal Tree Valuation (UTV) assessment.

1. Proposed Wording for the Option

Scope of Cover:

This policy insures specified living trees, listed in your policy schedule and supported by a current Universal Tree Valuation (UTV) appraisal, against loss or damage caused by the following perils:

1. Fire or lightning
2. Impact by vehicles, aircraft, or falling objects (e.g., other trees, branches, or structures)
3. Storm damage (wind, hail, or snow)
4. Malicious acts (including vandalism or arson)
5. Theft or illegal removal

Exclusions:

This policy does not cover:

- Loss or damage due to natural death, disease, or pests.
- Costs of pruning, fertilisation, or general maintenance.
- Damage caused by the insured's own negligence (e.g., failing to follow arborist recommendations).
- Gradual wear and tear, soil movement, or drought.

Policy Basis:

- All insured trees must be professionally assessed using the Universal Tree Valuation (UTV) method, conducted by a qualified arborist.
- Claims are settled based on the UTV-determined market value (up to the stated limit). For unique or heritage trees, the policy does not cover the cost of professional replacement, replanting, or equivalent restoration.
- Cover includes removal of damaged trees and debris, up to \$5000 per event.

2. Proposed Policy Limits and Excess Levels

- **Standard Limit:** \$5,000 per tree / \$20,000 total annual limit
- **Optional Higher Limit:** \$20,000 per tree / \$100,000 total annual limit (for high-value or heritage trees)
- **Excess:** \$250 per claim per tree

3. Proposed Premium Calculation

Premiums are calculated based on tree value, regional risk, and the number of trees insured, as verified through UTV.

Formula:

Base Premium = Number of Trees × (Insured Value per Tree × Risk Factor × Claims Cost Multiplier)
+ Fixed Administration Fee

- **Risk Factor:**
 - Low-risk area: $0.005 \times \text{Insured Value}$
 - High-risk area: $0.01 \times \text{Insured Value}$
- **Claims Cost Multiplier:** 3% of Insured Value

Example Premium:

Homeowner insures 2 trees at \$5,000 each in a storm-prone region:
Premium = $(2 \times (\$5,000 \times 0.01 \times 0.03)) + \$50 = \mathbf{\$80 \text{ per year}}$

4. Additional Considerations

1. **UTV & Arborist Assessment Requirement:**
 - All specified trees must be appraised using the Universal Tree Valuation method by a qualified arborist before coverage is issued.

- A UTV re-assessment is required every 3–5 years, or after major damage or structural changes.
2. **Discount for Sustainable Practices:**
- Premium discounts may apply for homeowners who demonstrate certified sustainable tree care practices (e.g., mulching, irrigation systems, pest prevention plans).
3. **Claims Handling:**
- Claims will be processed with reference to the original UTV appraisal. Partnerships with certified arborists and tree services will facilitate prompt valuation confirmation, removal, and restoration.
4. **Target Market:**
- Homeowners with heritage trees, rare or ornamental species, or significant landscaping investments.
 - Positioned as a premium add-on for high-value homeowner policies, particularly in storm-prone or conservation-sensitive areas.

Beyond this 'Domestic Tree Insurance' could be an expansion into a much larger insurance market including Councils and local bodies with high value tree assets like Parks and reserves, sports grounds and Cemeteries. Larger commercial properties with tree assets may also include Golf courses, recreation venues, Mountain Bike parks etc. Tree insurance may also be welcomed by those who consider climate change a threat to their tree assets with increased extreme weather events. Property developers may require insurance to cover potential tree damage or death due to construction and ground works.

The potential for an expanded market for the UTV App is possible, but would require fundamental shifts in Insurance products and policies which is highly unlikely.

7. Legal and Intellectual Property Considerations

Developing the UTV App raises several legal and intellectual property (IP) considerations, particularly because it draws upon existing tree valuation systems such as CTLA, CAVAT, STEM, and Burnley. While these methods are open source, and without restrictive licensing, they are required to be used appropriately and accurately. In general, referencing these systems for educational or comparative purposes is generally acceptable, directly replicating their formulas, valuation tables, or branding within a commercial product, may require advice. Where necessary, we developers should seek permission from the organisations that maintain these valuation systems. This is likely an area for the App developer to investigate or at the very least, legal advice will be sought. The UTV methodology should be presented as a transformative, original system that borrows general concepts without duplicating proprietary materials. UTV model itself, being a hybrid, data-driven framework, may qualify for IP protection. Developers should consider copyrighting the valuation algorithm, securing trademark rights for the “Universal Tree Valuation” name and logo, and documenting the design and development process to support ownership claims. As the app is likely to produce data used in professional or legal contexts, it must also include clear disclaimers to limit liability, such as stating that valuations are indicative only and do not replace formal professional assessments. If the app gains commercial traction, professional indemnity insurance should be considered to mitigate legal risks related to valuation errors or disputes.

Privacy and data protection are also essential concerns. If the app collects user inputs, GPS data, or images, it must comply with regional privacy laws such as GDPR (Europe), CCPA (California), or the New Zealand Privacy Act. A clear privacy policy should explain what data is collected, how it is stored, and what rights users have. Furthermore, if the app uses open source libraries or third party tools (e.g., for tree identification or image processing), developers must ensure compliance with relevant software licenses. By addressing these legal and IP matters from the outset, the UTV App can launch as a professional, defensible tool within the arboricultural and environmental management space.

Discussion.

The need for a Universal Tree Valuation (UTV) system arises from the significant inconsistencies and volatility present in current tree valuation methods. An analysis of four leading systems, STEM, CTLA, Burnley, and CAVAT, demonstrated wide disparities in valuation outcomes for the same trees. CTLA and CAVAT tended to inflate values, particularly for prominent or large specimens, while Burnley delivered conservative, often undervalued results. STEM provided consistent but moderate figures. These differences, especially the volatile distributions seen in CAVAT and CTLA, highlight the difficulty in producing valuations that are both reliable and defensible across professional, legal, and insurance contexts.

To address these issues, the UTV system proposes a weighted average model that integrates the strengths of each method while minimising their extremes. The weighting, based on estimated global usage (CTLA 50%, CAVAT 30%, Burnley 15%, STEM 5%), aims to reflect practical relevance while offering a transparent and balanced valuation. Although the resulting values often resemble those of CTLA, the UTV model offers improved legitimacy by reducing outlier influence and providing a clearly structured framework. It is especially valuable in cross-jurisdictional situations where no single system dominates. When integrated into a smartphone app, the system becomes not only accessible but also scalable to a wider user base.

The proposed UTV App harnesses smartphone technology to streamline tree valuation through intuitive inputs, location services, and built in valuation logic. App development consultations have shown the project is feasible within a \$4,000–\$20,000 budget, especially if development is approached in stages. Market research indicates a niche and infrequent user base of 25,000–60,000 qualified consultants, with broader application potential across industries such as insurance, urban planning, and development. Further potential markets include the integration of UTV into a draft “Domestic Tree Insurance” policy, which fills a current gap in the insurance sector by enabling formal valuation and protection of high value residential and public trees. That said, the expansion of users required to make UTV a marketable and profitable enterprise relies on factors well beyond the realms of probability.

Looking forward, the potential for technological advancement in this space is significant. Beyond the current app design, it is entirely feasible that AI will soon enable tree valuation via a single photograph. Artificial intelligence, alongside emerging LIDAR technology could accurately identify species, measure physical dimensions, assess location and visibility, and even source nursery prices, all within seconds. This level of automation could revolutionise how we appraise urban trees, making valuation faster, more objective, and more widely accessible. The groundwork laid by the UTV framework positions it well for integration into such future innovations, ensuring that valuation remains credible, data driven, and aligned with evolving technology. A Hungarian company Greehill have been marketing such a system, but captures multiple trees and surrounding infrastructure from a trailer mounted vehicle. Its 3d scanning can accurately capture the dimensions, position and species of the tree and provide a valuation, alongside many other attribute of the tree, all within seconds of driving past.

Conclusion.

This research has highlighted the fundamental shortcomings in current global tree valuation methods, particularly the inconsistencies in outputs produced by systems such as STEM, CTLA, Burnley, and CAVAT. The analysis demonstrated that these methods often deliver widely varied results when applied to the same trees, influenced by regional priorities, methodological assumptions, and subjective inputs. The statistical evaluation of valuation data revealed skewed distributions and high variability in methods like CAVAT and CTLA, while systems like Burnley and STEM showed lower volatility but potentially undervalued significant specimens. These disparities create confusion for arborists, limit the credibility of tree valuation in adjacent sectors such as law and insurance, and expose the need for a standardised, balanced approach.

The proposed Universal Tree Valuation (UTV) system directly responds to this need by creating a hybrid model that incorporates the strengths of each valuation method while minimising their respective weaknesses. The weighted average approach, informed by real world usage estimates, ensures the model remains grounded in practicality while enhancing transparency and fairness. Although the resulting figures often parallel those produced by CTLA, the UTV method offers a more defensible framework by aggregating multiple perspectives into one unified calculation. When embedded into a smartphone application, the UTV system becomes a powerful, scalable tool that improves efficiency, enhances accessibility, and increases trust in tree valuation practices across disciplines.

The limitations exposed by this research highlight considerable challenges in not only the UTV Hybrid system itself, but also the feasibility of bringing the App platform to fruition. The UTV system, while positioning itself as a hybrid, does represent another system in the vast mix of methods currently used globally and as such adds to the problem of abundance. It is unlikely the largest geographic and user base, U.S.A. would adopt a new system which closely mirrors that of its own most commonly used system, CTLA. Also, the mix of methods applied to the UTV Hybrid is highly debatable, while a balanced geographic spread may have been achieved with the inclusion of the 4 most commonly used methods, a better mix could well be argued for in terms of parameters and biases. By exchanging Burnley and STEM with AANZAA, it could be argued, the geographic balance is retained, but a more holistic measure of tree value could be attained.

In essence the underlying limitations of each system remain, not least of which CTLA and Burnley reliance on an ambiguous Basic Cost. Again, AANZAA would mitigate this problem with its basic unit of measurement being an agreed, standardised, CPI adjusted base value, a far more reliable and accurate baseline. Rather than Burnley's ambiguous and tedious reliance on nursery specimens average value.

In conclusion, the UTV Weighted average system would be improved by streamlining and reducing the input of unreliable variables. A reduced group of three, CTLA, CAVAT and AANZAA-Value/25 would better reflect a holistic set of valuation parameters and improve accuracy and repetition by

reducing the input variables to one. That being the CTLA Basic Cost, being that of the most commonly sold nursery tree in the local area.

At the very least this project has created a platform for discussion, with the possibility of an agreed set of valuation methods integrated into the hybrid UTV system at an agreed weighting.

The Apps digital platform, does however present a real progression of usable technology, with the only limitation being one of marketability within a narrow, niche and infrequent specialist market. The positive marketability of the App would rely heavily on adjacent and new markets to emerge to make it a profitable enterprise.

The integration of UTV into a digital platform however, represents a step forward for arboriculture and allied industries. The prototype app concept, supported by preliminary market engagement and development consultation, indicates strong viability in functionality but limitations in potential uptake. Early applications of the system, such as its theoretical inclusion in a draft Domestic Tree Insurance policy, demonstrate the model's potential practical value. This not only potentially fills a longstanding gap in the insurance market but also points toward broader opportunities in urban planning, asset management, and construction. The ability to generate consistent, verifiable, and jurisdictionally portable tree valuations could reshape how urban trees are managed and protected. Essentially, the ease and efficiency associated with the App platform, could provide a catalyst for a more commonplace practice. In providing a valuation alongside other Arboricultural consulting documentation and reports, we would likely see a beneficial improvement in perceived tree value, even if only at a monetary measure.

Within the tree care industry, a more frequent use of valuations could emerge through further App enhancements, such as an integrated VTA (Visual Tree Assessment) document that includes as standard, a tree appraisal. This may require a separate standalone App, but could include much of the parameters of the UTV App. Indeed, an App based VTA with an integrated appraisal would greatly increase the exposure to tree valuations considering the abundance of VTAs required in comparison with the infrequency of appraisals/valuations.

Looking beyond the current framework, this project envisions a future in which artificial intelligence further enhances the accuracy and efficiency of digital tree valuation. As noted in the discussion, a future app could be powered by AI and rely solely on a photograph to identify a tree's species, measure its dimensions with emerging LIDAR technology, determine its geographic context, and calculate value using pre-set formulas. These advancements are not only possible, they are imminent. The foundation laid by the UTV App model positions it as a ready made system for integration into such future technologies.

In essence this research, while inconclusive in answering its initial query, 'Can technology promote tree value?', points to potential to do so and charts a path toward a more intelligent and standardised future for tree valuation.

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Appendix

Hooper, M. (2025). *Advanced tree valuation* (Unpublished manuscript). Wintec, Diploma of Arboriculture ARBO606.

Attached as separate document.