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~To Be A Reference for Ecosystem Quality~



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TABLE OF CONTENTS

From the Chief Editor's Desk	1
The Editorial Team	2
Vision and Mission of IEB	6
Past Events	7
Winning Awards	18
The Giant Passion Fruit (<i>Passiflora quadrangularis</i> L.): Their Uniqueness and Potential Uses	20
Food Waste: Where It Should Go	22
Understanding Economic Valuation Towards Biodiversity Conservation in Sarawak's National Parks	24
Indigenous Leafy Vegetables of Sarawak	27
Refuse to Resource: Refused Sago Starch Flour for Urea Encapsulation	30
Target Plant Concept (TPC): A Holistic Framework for Seedling Quality within a Forest Restoration Programme	35
An Idea for Compensating Local Farmers for a Sustainable Method of Pineapple Farming	41
Iban Women and Side-Income Activities in Sarawak	50
3D Printing Prototype Redox Flow Battery	59
List of Journal Publications 2022	62



PUBLICATION

Target Plant Concept (TPC): A Holistic Framework for Seedling Quality within a Forest Restoration Programme

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The quality of seedlings is essential to any successful forest restoration programme. The physical and genetic characteristics of seedlings are referred to as seedling quality. Physical quality refers to the physical condition of seedlings as they grow in the nursery, whereas genetic quality refers to the genetic characteristics of the germplasm source [1]. Although good nursery practices can improve seedling's physical quality, there is no quick fix to enhance seedling genetic quality. The concept of seedling quality has evolved over the past century to the point where plant attributes are used to improve seedling nursery culture and forecast seedling survival and growth after outplanting [2].

The morphological and physical characteristics of plants have been examined. However, in reality, only a few attributes are utilised in operational programmes [3], because an "ideal operational measure" must be quick, easy, inexpensive, dependable, non-destructive, quantitative, and diagnostic [4]. Shoot height, root collar diameter, root systems, and shoot-to-root ratios are often measured based on morphological features [5]. According to Takoutsing et al. [6], these characteristics are easy to quantify in operational contexts, ensuring their usage in small-scale nurseries in developing countries and large commercial nurseries in first-world countries [7-9]. Morphological features influence seedling survival and growth after planting at forest restoration sites because they leave their mark on seedling attributes for long periods of time [2, 10]. Since they decrease vulnerability to planting stress by enhancing water intake and delivery to leaves, larger root collar diameter, and root system size increase the likelihood of survival and growth [2].

After South [11] examined Wakeley's [12] morphological criteria, it was discovered that root collar diameter remained the best trait for predicting field growth potential. In locations with competing plants, greater height provides a competitive advantage (i.e., access to light), according to several researchers. When possible site environmental circumstances are restrictive, seedlings with smaller shoot systems or lower shoot-to-root ratios are better acclimated (e.g., dry soils, high evaporative demand).

The Target Plant Concept (TPC) is a framework for combining plant production and field establishment into a single holistic process. Since numerous plant characteristics are linked to outplanting success, seedlings should be cultivated in a nursery with the planned outplanting site circumstances in mind. Plant qualities that are likely to lead to project success should be identified in collaboration between nursery growers and field managers.

Dumroese et al. [13] offered a full overview of the framework's main concepts as well as examples of how it might be used. The TPC framework proposes quantifiable plant characteristics as seedling production "targets". Based on constant monitoring of field performance, the targets can be fine-tuned each season. Other features, such as root systems [14, 15] and internal or physiological attributes [16, 17], are quantitative and thus worthy considerations. Application of seedling growth models [18] may enable more robust forecasts of post-planting performance as data management becomes more viable in real-time decision-making.

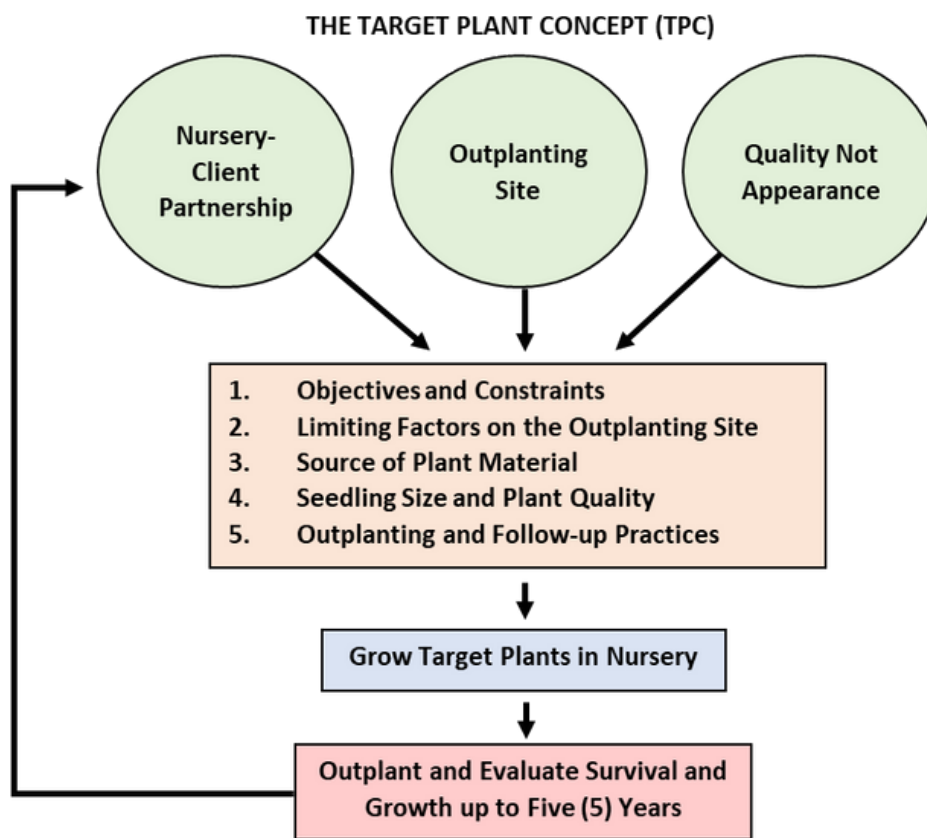


Fig. 1: The Target Plant Concept (TPC) starts with three key elements that guide a cyclic improvement process: nurseries must work together with clients, target plants are defined at the outplanting site, and quality, not appearance, dictates success. Five core components then provide a framework for creating the target plant. The plants are grown, outplanted, and evaluated before starting and improving the cycle again (adapted from Dumroese et al. [13]; Landis [19]).





Further Information



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