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“Bridging the gap between increasing knowledge and decreasing resources”

## Evaluation of a Visual Vitality Assessment to Detect Indicators for Stress and Yield for Cacao

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### Abstract

In a field trial, situated on a commercial farm in Malaysia, the performance of three cacao clones is evaluated under three production systems mainly characterised by diversification levels (mono culture to high diversity agroforestry). At the beginning of the project the canopy of the twenty-two-year-old trees was pruned back to the leader structure and then rebuilt. The plantation surrounding the trial proved to be a constant source for diseases and pests impairing the recovering trees. To monitor stress levels and to compare the performance of the different clones under the applied production systems, a tool to compare physiological condition in quantifiable terms is advantageous. In other studies the concepts of tree vigour and vitality are often used for this purpose.

Definitions of vigour and vitality as well as methods on how to assess them, are numerous and vary considerably in their scope. Reported parameters include tree height, stem circumference, carbohydrate content in sap, visual assessment of growth vigour, crown density, flowering intensity, and so on. Studies from environmental surveys show that a close observation of visually assessable vigour parameters could help to appraise quickly and non-destructively the status of a tree, to detect stress factors such as diseases, pests and nutrient deficiencies and to forecast yield levels. For agricultural tree crops the term vigour is mainly used to describe the vigorousness of tree growth, which relates to maintenance efforts. The ability to efficiently and comprehensively detect stress factors and reliably quantify stress levels would certainly be useful, nevertheless the general vitality of tree crops is seldom assessed. For cacao no comparable tree vitality study is known. Therefore a suitable assessment tool encompassing a variety of vitality indicators had to be developed and tested as part of the experiment.

The difficulty was firstly to identify and measure suitable indicators of vitality, secondly to assess the strength of the stress and thirdly to determine the absolute or relative level of vitality. First results compare the correlation of yield performance and tree vitality, along with the evaluation of clone performance and identification of potential characteristic problems related to the three production systems.

**Keywords:** Cacao, production system comparison, tree vitality assessment