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criterion. These are combinations 8 (AIC = 36.01), 9 (38.93) and 2 (47.67). These have the most accurate and significant proportions of variability, reinforced by Tukey's USD tests. The equation lines associated with these combinations are those that could best predict potential fruit production in a lightly anthropized forest.

Finally, three combinations that best predict fruit production of *R. heudelotii* each have three variables with low AIC values in both land use types with high correlations. And each of the combinations has an associated fit line with established equations.

Table IX. Regression of the most relevant combinations for the prediction of fruit production in the two land use types

| N° | | AIC | $R^2$ | p-value | Regression equations |
|---|---|---|---|---|---|
| 1 | | 47.67 | 87.27% | 0.0001<0.05 | PT = 45.52+2.46*NnT+2.54*Distj-1.80*HmC |
| 2 | Forest | 36.01 | 94.81% | 0.0001<0.05 | PT = 87.33+2.20*Distj-0.74*HS-2.05*HmC |
| 3 | | 38.93 | 93.50% | 0.0001<0.05 | PT = 113.69-2.68*NnT-0.89*HS-2.09*HmC |
| 1 | | 64.42 | 93.93% | 0.0001<0.05 | PT = -35.86+1.29*HS+5.40*Distj-9.10*NnT |
| 2 | Agroforest | 65.46 | 93.54% | 0.0001<0.05 | PT = 209.52-6.47*HmC-0.93*HS+0.95*Distj |
| 3 | | 64.40 | 93.93% | 0.0001<0.05 | PT = 245.70-6.50*HmC-1.65*HS-2.94*NnT |

Overall, the correlations become more refined and accurate as the number of variables regressed increases with respect to the Aikake information criterion (AIC). Thus, in both types of land use, these combinations are most relevant when they involve, on the one hand, the number of competitors of greater height than the subject individuals and, on the other hand, the height of the subject individual and the average height of the competitors and the distance between the competitors and the subject individuals. This means that height is the main dendrometric descriptor that is most relevant for predicting fruit production in a nearest neighbour’s competition context.

## 4. Discussion

### Variation of total production according to dendrometric parameters

The aim of this work is to propose simple allometric equations for predicting the fruit production of *Ricinodendron heudelotii* (Baill.) based on the dendrometric characteristics of the subject individuals and their close neighbours. To achieve this, the dendrometric characteristics relating to height (competitors and subjects), diameter (competitors and subjects), density, basal area, number of competitors taller than the subject individual and distance between the competitor and the subject individual were tested using simple and multiple regressions.

The results obtained show a large and significant difference in production in the agroforest versus forest surveys. A similar result allowed Lamien et al (2004) to find high proportions of productivity of trees in agroforestry parks compared to trees in natural formations.

The analysis of the variations in total cumulative fruit production as a function of some dendrometric parameters showed that the diameter (of the tree and its close neighbours) does not have a significant influence on it. This is not the case for height (subject and potential competitors) which significantly influences total fruit production (p-value < 0.05). The significant influence of height certainly justifies the severity of horizontal competition obtained in this study in both agroforests and forests. Indeed, taller neighboring trees can shade and prevent light capture by others. As *R. heudelotii* is a heliophilic species, competition for light would therefore affect its productivity (Djeugap Fovo et *al*., 2013). A similar observation will make Tabarant (2007) say that, the role of light is very important, as variations in its spectrum influence the growth, reproduction and production of the forest.

Fruit production varies significantly with both density and the number of competitors taller than the subject tree. Agroforests have low densities but high total cumulative fruit production compared to forest surveys. Indeed, at low densities as observed in agroforests, tree-tree competition is not a limiting factor (Scholes and Archer, 1997), as it might be in forests where densities are high.

The results obtained showed that fruit production is not optimal when the distance between the competitor and the subject-tree is reduced. Thus, a tall competitor would have a negative influence on the fruit production of the subject-tree if the distance between the two individuals is small. This observation could be explained by the fact that the influence of a neighboring-tree on the competence of a target tree is a direct function of the neighbour's height and an inverse function of the neighbour's distance (Uriarte et *al*. 2004).

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Thus, combinations of individual subject and competitor heights, as well as the number of competitors taller than the subject, individually predict fruit production better. These have lower AIC values. Combinations with density and distance of competitors from the subject tree could also be considered as a predictor variable although AIC values are high in agro-forests. In forest surveys, the combinations all have low AIC values, justifying the influence of each physical descriptor used. Indeed, Burnham and Anderson (2002), Mbow et *al*. (2013), Sileshi (2014) and Laminou Manzo et *al*. (2015), have shown that the Akaike information criterion (AIC) is a decisive validation element of a prediction model, as well as the different statistical tests and the standard residual error.

Indeed, the fact that low AIC values influenced the choice of these equations corroborates the result obtained by Mbonayem Liboum and Bobo (2017) when studying the growth of Moabi. These authors showed that the combinations that provided the lowest AIC values were retained as potentially usable in predictive models of Moabi growth.

## 5. Conclusion

The present study allowed the evaluation of the fruiting potential of *Ricinodendron heudelotii* (Baill.) and also to assesses its variability according to dendrometric descriptors in two types of land use. The results obtained show that the height of individuals (subjects and close neighbours) has a greater influence on fruit production than the other dendrometric descriptors. Thus, from the allometric combinations by simple and multiple linear regressions, the variability of fruit potential of *Ricinodendron heudelotii* (Baill.) for the explanatory variables chosen in this study. Three combinations were selected from the low values of the Aikkake information criterion (AIC). These three combinations can be used to predict fruit yields of *Ricinodendron Heudelotii* (Baill.) from the dendrometric descriptors. They can also be used by decision-makers for domestication projects of this species. Thus, this study could be extended to other environmental parameters such as soil, climate, etc. for a fruit potential that contributes to food security and poverty reduction.

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