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## Growth performance of *Dipterocarpus alatus* and *Hopea odorata* in degraded secondary forest land in Southern Vietnam

### Supplementary Material

Table S1. Description of tree growth variables in *D. alatus* and *H. odorata*

| Variable                                     | Mean $\pm$ SD    |                   |
|----------------------------------------------|------------------|-------------------|
|                                              | <i>D. alatus</i> | <i>H. odorata</i> |
| Diameter at breast height – DBH (cm)         | 23.9 $\pm$ 5.1   | 20.9 $\pm$ 4.8    |
| Tree height – H (m)                          | 14.1 $\pm$ 0.9   | 13.4 $\pm$ 0.8    |
| Tree height at first branch – Hb (m)         | 7.2 $\pm$ 1.1    | 7.1 $\pm$ 1.1     |
| Crown diameter – CD (m)                      | 5.6 $\pm$ 1.0    | 5.5 $\pm$ 0.8     |
| Crown length – CL (m)                        | 6.9 $\pm$ 1.3    | 6.3 $\pm$ 1.0     |
| Crown projection area- CPA (m <sup>2</sup> ) | 25.1 $\pm$ 8.8   | 24.4 $\pm$ 7.2    |
| Crown ratio – CR                             | 0.49 $\pm$ 0.08  | 0.47 $\pm$ 0.07   |
| Crown spread ratio – CSR                     | 0.39 $\pm$ 0.06  | 0.41 $\pm$ 0.06   |
| Crown thickness index – CTI                  | 0.8 $\pm$ 0.2    | 0.9 $\pm$ 0.2     |
| Linear crown index – LCI                     | 0.24 $\pm$ 0.03  | 0.27 $\pm$ 0.05   |

SD – Standard deviation.

Table S2. Variable description in training and testing sets for linear discriminant analysis

| Variables                      | Mean $\pm$ SD          |                       |                        |                       |
|--------------------------------|------------------------|-----------------------|------------------------|-----------------------|
|                                | <i>D. alatus</i>       |                       | <i>H. odorata</i>      |                       |
|                                | Training set (n = 255) | Testing set (n = 170) | Training set (n = 240) | Testing set (n = 160) |
| Diameter at breast height (cm) | 23.8 $\pm$ 5.2         | 24.2 $\pm$ 4.9        | 21.0 $\pm$ 4.7         | 20.7 $\pm$ 4.8        |
| Tree height (m)                | 14.1 $\pm$ 0.9         | 14.1 $\pm$ 1.0        | 13.4 $\pm$ 0.8         | 13.4 $\pm$ 0.9        |
| Crown diameter (m)             | 5.5 $\pm$ 1.0          | 5.6 $\pm$ 1.0         | 5.6 $\pm$ 0.8          | 5.4 $\pm$ 0.9         |
| Crown length (m)               | 6.9 $\pm$ 1.3          | 6.9 $\pm$ 1.4         | 6.3 $\pm$ 1.0          | 6.3 $\pm$ 1.0         |

SD – Standard deviation.

Table S3. DBH and height increments of *D. alatus* and *H. odorata* under different stand ages and planting techniques, derived from different studies

| Location<br>(City/Province, Country) | Planting method            | Species                                                                  | Planting<br>year | Density<br>(tree/ha) | DBH<br>(cm) | H<br>(m) | MAID<br>(cm/year) | MAIH<br>(m/year) | Age<br>(year) | Reference           |
|--------------------------------------|----------------------------|--------------------------------------------------------------------------|------------------|----------------------|-------------|----------|-------------------|------------------|---------------|---------------------|
| Tay Ninh, Viet Nam                   | Monoculture                | <i>D. alatus</i>                                                         | 1984             | 1000                 | 17.2        | 13.4     | 1.01              | 0.79             | 17            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Monoculture                | <i>D. alatus</i>                                                         |                  | 208                  | 9.2         | 4.9      | 1.02              | 0.54             | 9             | To et al. (2014)    |
| Tay Ninh, Viet Nam                   | Monoculture                | <i>D. alatus</i>                                                         | 1988             | 1000                 | 15.3        | 10.7     | 1.17              | 0.82             | 13            | Nghia (2003)        |
| Tay Ninh, Viet Nam                   | Monoculture                | <i>D. alatus</i>                                                         | 1984             | 416                  | 22.4        | 13.5     | 1.32              | 0.79             | 17            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Monoculture                | <i>D. alatus</i>                                                         | 1990             | 416                  | 14.5        | 9.4      | 1.32              | 0.86             | 11            | Nghia (2003)        |
| Ba Ria Vung Tau, Viet Nam            | Monoculture                | <i>D. alatus</i>                                                         | 1987             | 1100                 | 19.9        | 11.7     | 1.42              | 0.83             | 14            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Monoculture                | <i>D. alatus</i>                                                         | 1983             | 312                  | 29.8        | 20.4     | 1.63              | 1.13             | 18            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Monoculture                | <i>D. alatus</i>                                                         |                  | 312                  |             |          | 1.63              | 1.13             | 18            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Mixed species plantation   | <i>D. alatus, Anacardium occidentale</i>                                 | 1985             | 416                  | 5.9         | 3.7      | 0.37              | 0.24             | 16            | Nghia (2003)        |
| Binh Phuoc, Viet Nam                 | Forest enrichment planting | Mixed dipterocarp                                                        | 1998             |                      |             |          | 0.76              | 0.6              | 10            | Pham (2009)         |
| Dong Nai, Viet Nam                   | Mixed species plantation   | <i>D. alatus, Acacia</i>                                                 | 1986             | 416                  | 8.6         | 6.4      | 0.61              | 0.45             | 14            | Nghia (2003)        |
| Binh Phuoc, Viet Nam                 | Forest enrichment planting | Mixed dipterocarp                                                        | 1998             |                      |             |          | 0.63              | 0.68             | 10            | Pham (2009)         |
| Nakhon Ratchasima,<br>Thailand       | Mixed species plantation   | <i>D. alatus, Leucaena leucocephala</i>                                  |                  | 625                  | 13.9        | 11.6     | 0.70              | 0.58             | 20            | Sakai et al. (2014) |
| Tay Ninh, Viet Nam                   | Mixed species plantation   | <i>D. alatus, Acacia</i>                                                 | 1993             | 500                  | 6.2         | 4.6      | 0.78              | 0.57             | 8             | Nghia (2003)        |
| Binh Phuoc, Viet Nam                 | Forest enrichment planting | Mixed dipterocarp                                                        | 1998             |                      |             |          | 1.1               | 0.72             | 4             | Pham (2009)         |
| Binh Phuoc, Viet Nam                 | Mixed species plantation   | <i>D. alatus, Anacardium occidentale</i>                                 | 1995             | 625                  | 5.0         | 3.7      | 0.83              | 0.61             | 6             | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Mixed species plantation   | <i>D. alatus, Anacardium occidentale</i>                                 | 1995             | 300                  | 5.0         | 4.5      | 1.00              | 0.95             | 5             | Nghia (2003)        |
| Tay Ninh, Viet Nam                   | Mixed species plantation   | <i>D. alatus, Acacia</i>                                                 | 1994             | 500                  | 8.0         | 5.1      | 1.14              | 0.73             | 7             | Nghia (2003)        |
| Binh Phuoc, Viet Nam                 | Mixed species plantation   | <i>D. alatus, Acacia</i>                                                 | 1990             | 550                  | 13.4        | 10.7     | 1.21              | 0.97             | 11            | Nghia (2003)        |
| Binh Duong, Viet Nam                 | Mixed species plantation   | <i>D. alatus, Khaya senegalensis</i>                                     | 1999             | 416                  | 2.5         | 2.0      | 1.23              | 0.98             | 2             | Nghia (2003)        |
| Phu Yen, Viet Nam                    | Mixed species plantation   | <i>D. alatus, Ailanthus triphylla, H. odorata, Erythrophloeum fordii</i> |                  | 625                  | 7.7         | 4.7      | 1.28              | 0.78             | 6             | Vo & Hoang (2014)   |
| Binh Phuoc, Viet Nam                 | Mixed species plantation   | <i>D. alatus, Anacardium occidentale</i>                                 | 1996             | 550                  | 6.5         | 4.5      | 1.29              | 0.90             | 5             | Nghia (2003)        |
| Binh Phuoc, Viet Nam                 | Mixed species plantation   | <i>D. alatus, Acacia</i>                                                 | 1990             | 416                  | 14.7        | 8.4      | 1.33              | 0.77             | 11            | Nghia (2003)        |
| Ba Ria Vung Tau, Viet Nam            | Mixed species plantation   | <i>D. alatus, Anacardium occidentale</i>                                 | 1987             | 550                  | 20.1        | 12.1     | 1.44              | 1.50             | 14            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Mixed species plantation   | <i>D. alatus, Acacia, coffea, Anacardium occidentale</i>                 |                  | 300                  |             |          | 1.46              | 0.91             | 17            | Nghia (2003)        |

| Location<br>(City/Province, Country) | Planting method          | Species                                                                  | Planting<br>year | Density<br>(tree/ha) | DBH<br>(cm) | H<br>(m) | MAID<br>(cm/year) | MAIH<br>(m/year) | Age<br>(year) | Reference           |
|--------------------------------------|--------------------------|--------------------------------------------------------------------------|------------------|----------------------|-------------|----------|-------------------|------------------|---------------|---------------------|
| Binh Duong, Viet Nam                 | Mixed species plantation | <i>D. alatus, Khaya senegalensis</i>                                     | 1998             | 416                  | 4.4         | 3.0      | 1.47              | 0.98             | 3             | Nghia (2003)        |
| Binh Phuoc, Viet Nam                 | Mixed species plantation | <i>D. alatus, Anacardium occidentale</i>                                 | 1996             | 400                  | 8.3         | 5.5      | 1.65              | 1.09             | 5             | Nghia (2003)        |
| Tay Ninh, Viet Nam                   | Mixed species plantation | <i>D. alatus, Acacia</i>                                                 | 1993             | 200                  | 14.1        | 6.6      | 1.76              | 0.82             | 8             | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Mixed species plantation | <i>D. alatus, Coffea</i>                                                 | 1984             | 280                  | 30.2        | 17.3     | 1.78              | 1.02             | 17            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Mixed species plantation | <i>D. alatus, Anacardium occidentale</i>                                 | 1985             | 370                  | 11.5        | 7.0      | 1.92              | 1.16             | 6             | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Mixed species plantation | <i>D. alatus, Anacardium occidentale</i>                                 | 1993             | 185                  | 19.8        | 16.6     | 2.48              | 2.08             | 8             | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Mixed species plantation | <i>D. alatus, Coffea</i>                                                 | 1993             | 280                  | 20.4        | 12.6     | 2.55              | 1.57             | 8             | Nghia (2003)        |
| Binh Phuoc, Viet Nam                 | Mixed species plantation | <i>D. alatus, Anacardium occidentale</i>                                 | 1995             | 250                  | 15.7        | 6.6      | 2.62              | 1.09             | 6             | Nghia (2003)        |
| Binh Duong, Viet Nam                 | Mixed species plantation | <i>D. alatus, Anacardium occidentale</i>                                 | 1999             | 416                  | 5.8         | 3.6      | 2.92              | 1.81             | 2             | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Mixed species plantation | <i>H. odorata, Acacia</i>                                                | 1984             | 416                  | 6.9         | 6.3      | 0.43              | 0.39             | 16            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Mixed species plantation | <i>D. alatus, Anacardium occidentale</i>                                 | 1986             | 416                  | 6.6         | 6.3      | 0.47              | 0.32             | 14            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Mixed species plantation | <i>H. odorata, Acacia sp.</i>                                            | 1985             | 5000                 | 7.5         | 6.7      | 0.49              | 0.46             | 15            | Nghia (2003)        |
| Binh Phuoc, Viet Nam                 | Mixed species plantation | Mixed dipterocarp                                                        | 1998             |                      |             |          | 0.53              | 0.42             | 4             | Pham (2009)         |
| Dong Nai, Viet Nam                   | Mixed species plantation | <i>H. odorata, Acacia</i>                                                | 1982             | 416                  | 11.7        | 8.2      | 0.65              | 0.45             | 18            | Nghia (2003)        |
| Binh Phuoc, Viet Nam                 | Mixed species plantation | <i>H. odorata, Acacia</i>                                                | 1994             | 416                  | 4.1         | 3.4      | 0.69              | 0.56             | 6             | Nghia (2003)        |
| Nakhon Ratchasima,<br>Thailand       | Mixed species plantation | <i>H. odorata, Leucaena leucocephala, D. turbinatus, S. henryana</i>     |                  | 625                  | 15.9        | 13.8     | 0.80              | 0.69             | 20            | Sakai et al. (2014) |
| Binh Phuoc, Viet Nam                 | Mixed species plantation | <i>H. odorata, Acacia</i>                                                | 1995             | 416                  | 4.1         | 2.9      | 0.81              | 0.57             | 5             | Nghia (2003)        |
| Ba ria Vung Tau, Viet Nam            | Mixed species plantation | <i>D. alatus, Anacardium occidentale</i>                                 | 1982             | 2500                 | 14.7        | 15.8     | 0.82              | 0.88             | 18            | Nghia (2003)        |
| Binh Thuan, Viet Nam                 | Mixed species plantation | <i>H. odorata, Acacia</i>                                                | 1996             | 416                  | 3.4         | 2.2      | 0.84              | 0.54             | 4             | Nghia (2003)        |
| Binh Duong, Viet Nam                 | Mixed species plantation | <i>H. odorata, Acacia</i>                                                | 1984             | 416                  | 13.7        | 8.3      | 0.86              | 0.52             | 16            | Nghia (2003)        |
| Binh Thuan, Viet Nam                 | Mixed species plantation | <i>D. alatus, Anacardium occidentale</i>                                 | 1984             | 416                  | 14.5        | 7.2      | 0.90              | 0.45             | 16            | Nghia (2003)        |
| Ha Noi, Viet Nam                     | Mixed species plantation | <i>Hopea, Acacia, Pinus</i>                                              | 2011             | 700                  | 4.5         | 2.3      | 0.90              | 0.46             | 5             | Nguyen & Ta (2016)  |
| Dong Nai, Viet Nam                   | Mixed species plantation | <i>D. alatus, Anacardium occidentale</i>                                 | 1984             | 416                  | 17.0        | 11.3     | 1.06              | 0.71             | 16            | Nghia (2003)        |
| Binh Duong, Viet Nam                 | Mixed species plantation | <i>H. odorata, Acacia</i>                                                | 1984             | 416                  | 17.2        | 9.6      | 1.07              | 0.60             | 16            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Mixed species plantation | <i>D. alatus, Anacardium occidentale</i>                                 | 1996             | 200                  | 4.4         | 2.7      | 1.11              | 0.67             | 4             | Nghia (2003)        |
| Phu Yen, Viet Nam                    | Mixed species plantation | <i>D. alatus, Ailanthus triphyssa, H. odorata, Erythrophileum fordii</i> |                  | 625                  | 6.7         | 5.8      | 1.12              | 0.97             | 6             | Vo & Hoang (2014)   |
| Dong Nai, Viet Nam                   | Mixed species plantation | <i>H. odorata, Tectona grandis</i>                                       | 1981             | 416                  | 21.2        | 14.2     | 1.12              | 0.75             | 19            | Nghia (2003)        |

| Location<br>(City/Province, Country) | Planting method            | Species                                  | Planting<br>year | Density<br>(tree/ha) | DBH<br>(cm) | H<br>(m) | MAID<br>(cm/year) | MAIH<br>(m/year) | Age<br>(year) | Reference           |
|--------------------------------------|----------------------------|------------------------------------------|------------------|----------------------|-------------|----------|-------------------|------------------|---------------|---------------------|
| Dong Nai, Viet Nam                   | Mixed species plantation   | <i>D. alatus, Anacardium occidentale</i> | 1993             | 200                  | 9.0         | 6.7      | 1.28              | 0.96             | 7             | Nghia (2003)        |
| Ba Ria Vung Tau, Viet Nam            | Mixed species plantation   | <i>H. odorata, Acacia</i>                | 1981             | 500                  | 24.8        | 20.5     | 1.30              | 1.08             | 19            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Mixed species plantation   | <i>H. odorata, Acacia</i>                | 1985             | 416                  | 19.7        | 10.7     | 1.31              | 0.72             | 15            | Nghia (2003)        |
| Binh Duong, Viet Nam                 | Mixed species plantation   | <i>H. odorata, Acacia</i>                | 1982             | 416                  | 24.2        | 11.3     | 1.34              | 0.63             | 18            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Mixed species plantation   | <i>D. alatus, Anacardium occidentale</i> | 1991             | 200                  | 12.2        | 7.4      | 1.36              | 0.82             | 9             | Nghia (2003)        |
| Ba Ria Vung Tau, Viet Nam            | Mixed species plantation   | <i>H. odorata, Acacia</i>                | 1982             | 500                  | 25.1        | 16.8     | 1.39              | 0.93             | 18            | Nghia (2003)        |
| Tay Ninh, Viet Nam                   | Mixed species plantation   | <i>H. odorata, Acacia</i>                | 1998             | 416                  | 4.5         | 2.9      | 1.49              | 0.97             | 3             | Nghia (2003)        |
| Binh Thuan, Viet Nam                 | Mixed species plantation   | <i>H. odorata, Acacia</i>                | 1994             | 250                  | 9.2         | 6.8      | 1.53              | 1.13             | 6             | Nghia (2003)        |
| Tay Ninh, Viet Nam                   | Mixed species plantation   | <i>D. alatus, Anacardium occidentale</i> | 1995             | 200                  | 9.4         | 3        | 1.56              | 0.50             | 6             | Nghia (2003)        |
| Tay Ninh, Viet Nam                   |                            | <i>Khaya senegalensis, H. odorata</i>    | 1997             | 416                  | 11.5        | 6.3      | 2.87              | 1.57             | 4             | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Monoculture                | <i>H. odorata</i>                        | 1982             | 2500                 | 14.6        | 16.5     | 0.81              | 0.91             | 18            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Monoculture                | <i>H. odorata</i>                        |                  | 208                  | 8.2         | 3.3      | 0.91              | 0.37             | 9.00          | To et al. (2014)    |
| Dong Nai, Viet Nam                   | Monoculture                | <i>H. odorata</i>                        | 1985             | 416                  | 16.6        | 11.7     | 1.10              | 0.78             | 15            | Nghia (2003)        |
| Pahang, Malaysia                     | Monoculture                | <i>H. odorata</i>                        |                  | 1100                 | 12.7        | 13.3     | 1.16              | 1.21             | 11            | Kusno et al. (2012) |
| Binh Phuoc, Viet Nam                 | Monoculture                | <i>H. odorata</i>                        | 1982             | 1250                 | 25.8        | 18.5     | 1.35              | 0.97             | 19            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Monoculture                | <i>H. odorata</i>                        | 1987             | 416                  | 21.9        | 12.5     | 1.68              | 0.95             | 13            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Monoculture                | <i>H. odorata</i>                        | 1987             | 416                  | 25.0        | 12.3     | 1.92              | 0.94             | 13            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Monoculture                | <i>H. odorata</i>                        | 1981             | 1660                 | 16.3        | 13.6     | 0.85              | 0.71             | 19            | Nghia (2003)        |
| Dong Nai, Viet Nam                   | Monoculture                | <i>H. odorata</i>                        | 1984             | 1160                 | 15.7        | 14.6     | 0.98              | 0.91             | 16            | Nghia (2003)        |
| Ba Ria Vung Tau, Viet Nam            | Monoculture                | <i>H. odorata</i>                        | 1982             | 1100                 | 18.7        | 17.3     | 1.04              | 0.96             | 18            | Nghia (2003)        |
| Ba Ria Vung Tau, Viet Nam            | Monoculture                | <i>H. odorata</i>                        | 1983             | 2200                 | 19.3        | 19.1     | 1.13              | 1.12             | 17            | Nghia (2003)        |
| Binh Phuoc, Viet Nam                 | Forest enrichment planting | Mixed dipterocarp                        | 1998             |                      |             |          | 0.69              | 0.61             | 4             | Pham (2009)         |
| Binh Phuoc, Viet Nam                 | Forest enrichment planting | Mixed dipterocarp                        | 1998             |                      |             |          | 0.4               | 0.38             | 4             | Pham (2009)         |
| Binh Phuoc, Viet Nam                 | Forest enrichment planting | Mixed dipterocarp                        | 1998             |                      |             |          | 0.49              | 0.55             | 10            | Pham (2009)         |
| Binh Phuoc, Viet Nam                 | Forest enrichment planting | Mixed dipterocarp                        | 1998             |                      |             |          | 0.39              | 0.55             | 10            | Pham (2009)         |
| Ha Noi, Viet Nam                     | Mixed species plantation   | <i>H. odorata, Acacia</i>                | 2011             | 700                  | 5.1         | 2.8      | 1.02              | 0.56             | 5             | Nguyen & Ta (2016)  |
| Ha Noi, Viet Nam                     | Mixed species plantation   | <i>H. odorata, Pinus</i>                 | 2011             | 700                  | 3.9         | 2.0      | 0.78              | 0.40             | 5             | Nguyen & Ta (2016)  |
| Ha Noi, Viet Nam                     | Monoculture                | <i>H. odorata</i>                        | 2011             | 700                  | 6.5         | 3.6      | 1.30              | 0.72             | 5             | Nguyen & Ta (2016)  |

MAID – Mean annual increment of diameter at breast height.

MAIH – Mean annual increment of tree height.