

# BIOMASS AND YIELD PARTITIONING IN *HEVEA BRASILIENSIS*: THE CONCEPT OF HARVEST INDEX REDEFINED

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The concept of harvest index (HI) requires redefining in a perennial crop like *Hevea brasiliensis* where the economic yield is a secondary metabolite that is produced in small quantities by large trees. Partitioning of total biomass into shoot biomass and rubber yield was accounted in tapped trees of *Hevea brasiliensis* on an annual basis for 12 consecutive years in five clones *viz.* RR11 105, RR11 300, PB 235, PB 260 and PB 311. Ratio of rubber yield per year to annual increment in shoot biomass per year was defined as HI in this tree crop. Among the five clones studied, RR11 105 had the highest HI (0.32) indicating that this clone is an efficient clone capable of partitioning more photosynthates in to rubber. But high yield and HI in this clone came with the cost of reduced shoot biomass compared to the PB clones. Rubber yield in PB 235 and PB 260 was on par with RR11 105, but the PB clones had much less HI than RR11 105. Improving HI in high biomass genotypes will result in better rubber yields and break the yield ceiling. Biomass production in untapped rubber trees was estimated and their CO<sub>2</sub> sequestration potential is also discussed.

**Key words:** Biomass, CO<sub>2</sub> sequestration, Harvest index, Rubber yield

## INTRODUCTION

Harvest index (HI) of a crop is a measure of the partitioning of biomass into economic yield, typically defined as the ratio of yield to total biomass (Brown, 1984, Hay, 1995). In annual crops such as rice, wheat *etc.* HI is the ratio of the grain yield to total biomass. One of the major reasons behind the success of green revolution has been the development of short duration crop varieties with high HI. In some varieties of rice and wheat, harvest index is as large as 0.5-0.6 (Austin *et al.*, 1980; Yang and Zhang, 2010).

Obviously, HI defined as above will be very low in tree crops such as apple, orange,

mango *etc.* where the total wood (shoot) biomass is very large compared to the economic yield. However, breeding for very small phenotypes with profuse fruiting has been successful in certain fruit crops (Webster, 2002). In the case of a perennial tree crop like *Hevea brasiliensis* where the economic yield is not a fruit or a seed but a secondary metabolite (cis-1, 4-polyisoprene), the concept of HI needs redefining. Total wood biomass of a mature rubber tree may be one ton or more, but it may produce a rubber yield of 3-6 kg tree<sup>-1</sup> year<sup>-1</sup>. When a virgin rubber tree is newly opened for tapping, rubber yield will be practically nil. With repeated tapping, the tree starts to produce more rubber. In other