The central agroforestry hypothesis: the trees must acquire resources that the crop would not otherwise acquire

M. G. R. CANNELL[1], M. VAN NOORDWIJK[2] and C. K. ONG[3]

[1] *Institute of Terrestrial Ecology, Bush Estate, Penicuik, Midlothian EH26 OQB, UK;* [2] *ICRAF-S.E. Asia, P.O. Box 161, Bogor 16001, Indonesia;* [3] *ICRAF, P.O. Box 30677, Nairobi, Kenya*

Abstract. A simple tree-crop interaction equation is re-interpreted in terms of resource capture. Benefits in physical yields from agroforestry are to be expected only when there is complementarity of resource capture by trees and crops. Most of the current biophysical hypotheses formulated for agroforestry research are based on this central tenet, specified for various resources, soil and climatic conditions.

Introduction

The overall objective of agroforestry research is to identify those circumstances (biophysical, socio-economic and policy) in which growing trees will give benefits to farmers. A common approach has been to consider the merits of different agroforestry 'systems', like alley-cropping, parklands, relay-intercropping and home gardens in different climatic regions (Nair, 1989). If the problem is to identify the socio-economic as well as the yield benefits of tree-crop combinations, then it may be important to consider the 'system'. But if the problem is to identify those circumstances in which growing trees and crops together can yield more biomass than growing crops alone, then it is more logical to think in terms of the physical resources of water, light and nutrients that are acquired or 'captured' by the trees and crops, regardless of the 'system' (Monteith et al., 1994). Although Price (1995) indicated a number of specific situations where agroforestry can give greater economic benefits than either a sole-crop or a sole-tree system in the absence of any biophysical yield increase, such situations are the exception rather than the rule and biophysical yield benefits are a good starting point for a more complete economic evaluation.

Recently, Ong (1995) and Ong et al. (1996, see also Sanchez, 1995) put forward the following equation:

$$I = F - C \tag{1}$$

where:

I = the net increase in crop yield attributable to the presence of trees, estimated over the land area occupied by crops plus trees, compared with sole-crop yield,