

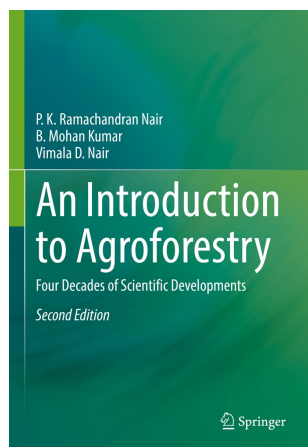
*Book review by Daniel Callo-Concha\**

## An Introduction to Agroforestry: Four Decades of Scientific Developments

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Agroforestry is perhaps the greatest success story in agricultural innovation of our time. In less than 50 years, it has transited from a bunch of techniques and technologies, to a ubiquitous subject in all fora dealing with production, environment and development. Its origins date back to the creation of the precursory



International Council for Research in Agroforestry (ICRAF) 50 years ago, where a group of pioneering researchers took it upon themselves to establish its scientific basis and explore its possibilities. One of those was PKR Nair, an Indian soil scientist with a remarkable talent for systematisation and scientific writing, later confirmed by its extraordinary prolificity. Not surprisingly, in 1993 PK Nair published *An Introduction to Agroforestry*, which became THE text book on the subject. Some knew that and update was on its way, but only 30 years after it came into light.

The volume has not disappointed. In six sections and 24 chapters spanning for more than 600 pages, the book covers every aspect that a novice student of the agroforestry science should know, and beyond that, what should know to understand the role of agroforestry role in the convoluted world and times we live in. Let us examine each of them briefly:

Section 1 outlines the history of institutional agroforestry, from its origins coincident with the conception of ICRAF in Sub Saharan Africa to the present day. It highlights people and milestones that made agroforestry a major land-use alternative today (Ch1). The section continues detailing the

necessary lexicon of agroforestry (Ch2), as well as the classification of agroforestry systems (AFS; Ch3); and concludes by exposing the distribution of AFS in the globe (Ch4), highlighting the regional prominence of some practices and the reasons for that. This introductory section did not change drastically from the first edition of the book, although some notable additions have been made, e.g., the updated classification framework, and the elaboration of the distinction between temperate and tropical AFS and their inherent linkages in the societies where they occur: the global north and the global south.

Section 2 is devoted to the description of major agroforestry practices (AFP), which in the first edition of the book became canonical for the discipline. It systematically describes and documents the scope, importance, and the biophysical and socio-economic characteristics of: shifting cultivation and taungya (Ch5), alley cropping and improved fallows (Ch6), homegardens (Ch7), perennial AFS including cocoa and coffee, as well as gardens and plantations dominated by multistrata trees and palms (Ch 8), and tropical and subtropical sylvopastoral systems (Ch9) most of those occurring in tropical and subtropical regions. The next chapter deals with temperate AFP (Ch10), which are mostly found in North America and Europe, and lately in Australia. The section closes with a chapter on “other” AFP that do not fit in the previous categories, a chapter that did not exist in the first edition. Here, AFP were cataloged for the functions they provide: firewood, fodder, medicine, protection, etc., while others, stretch to include broader social, landscape and environmental demands, such as community forestry, permaculture or Satoyama (Ch11). The extensively documented and well-illustrated section offers both a local and a global perspective to fulfill the objective of familiarizing the reader with the rich and diverse land uses considered now part of the agroforestry tradition.

Section 3 is a tribute to and historiography of the 2nd age of AF, which focused on unveiling its biophysical basis, pressing at those years, for its establishment as a scientific discipline. The section does it in three phases: (i) The prin-

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principles of plant production (Ch12) which some would consider an unnecessary detour, Nair chose to establish a conceptual foundation, useful for the following sections, but also key to making his book a one-stop reference, always appreciated in a text book. For example, in describing physiological traits of plants, that later will be the basis for fostering synergies and avoiding inter-species competition. (ii) The multipurpose tree species (Ch13), is a systematisation of the characteristics required by tree species used in AFS. The chapter not only profiles MPT species, but also recalls efforts to discover them and making them available, like the *cinderella* trees program, which identified, domesticated and promoted highly valuable but mostly unknown species in the 1990s. The chapter concludes with a lengthy botanical and agronomic catalogue of MPT, useful for practitioners, but which could well have been spared and retained as an appendix. (iii) The last chapter of the section deals with the interaction between trees and crops (Ch14), documenting in detail the mechanisms and research conducted to deal with competition for water, soil and light in agroforestry systems, above- and below-ground.

Section 4 deals with soil science. PK Nair, a soil scientist himself, gives a detailed overview of the subject and its links to agroforestry. Beginning with a general introduction on soil science (Ch15): soil classification and properties, soil health, and the virtues of agroforestry in keeping soils in good condition. Organic matter (Ch16) is discussed at length: the environmental importance of soil carbon in contributing to climate change mitigation, and its importance in nutrient cycling and its contribution to crop and tree fertility. Biological fixation of Nitrogen (Ch17) is of particular importance, given that several tree species are capable of doing so, besides the provision of other functions. The section ends with a chapter on soil conservation and soil degradation control (Ch 18), which was fundamental at the onset of agroforestry as a science, since the first practices were conceived and developed for those purposes, and lately gained great success, especially in temperate zones. Purposefully, the chapter revisits some linear technologies, such as contour hedgerows, windbreaks and alley cropping, among others.

Section 5 focuses on ecosystem services. Nair follows the late evolution of agroforestry from an alternative set of agricultural practices to a global instrument for more environmentally friendly land use. Launched with the Millennium Ecosystem Assessment (Ch19), a new classification of ecosystem services involved broader demands, i.e., provisioning, regulating and cultural services, to most of which agroforestry systems contribute greatly. For example, in carbon sequestration (Ch20) and the consequent climate change mitigation. Here Nair offers a tour de force, starting from

the basis of biological carbon sequestration, its instrumentalisation in agricultural land use systems, and the importance and differences of above- and below-ground sequestration. It even includes evaluation methods, laboratory techniques and modeling, to finalize with an overview through a global meta-analysis. Biodiversity conservation (Ch 21), also takes the reader step by step from the biological concepts and their intermingling with humans through ethnology and sociology, to demonstrate their intricate association. This is further supported by exposing the greater diversity of species, habitats and ecosystems when AFS are part of the landscape. It concludes by aligning these mechanisms with emerging notions such as sustainable intensification and multifunctionality. The section finalizes by discussing other ecosystem services (Ch22), such as water storage, cultural enrichment, spiritual benefits, general plant health (pests, diseases and weeds control), and even ecotourism. Although these are admittedly the least explored services, the framing provided by the agroforestry examples are quite illustrative.

Section 6, the last section, examines the current and future efforts expected from agroforestry. Food security and the achievement of Sustainable Development Goals (SDG) (Ch23) are at the top of the list. Despite its broad potential, agroforestry remains an unparalleled land use option for small farmers in developing societies. The evidence is conclusive, its multifunctional character endows it first with the production of food and nutrients, and later, with the generation of numberless products and services of various kinds at several scales. Finally, Nair elucidates on the future of agroforestry as global land-use (Ch24). He argues that after almost half a century, the agroforestry experiment has borne great fruit: moved from being an experimental technology to becoming a prominent approach on most development- and environmental-related agendas.

In the times we live, when knowledge evolves at a fast pace and boundaries are incessantly trespassed, PK Nair's ultimate attempt to make a one stop volume for the benefit of agroforestry students is quite commendable. The book's aim for comprehensiveness, abundant cross-referencing, and the embedding the views of experts and insiders go beyond the intent of a textbook, extending its usefulness for young agroforesters, but also as a reference for the experienced.

From my experience in the subject, I was certain that a textbook on agroforestry could only be written by a handful of people. I am glad that PK undertook the enterprise and carried out with such breadth and grace, crowning also with it his remarkable career.