Tropentag 2011
University of Bonn, October 5 - 7, 2011
Conference on International Research on Food Security, Natural Resource Management and Rural Development

# Historical Paradigm Shifts in Tropical Forest Plantations

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**Abstract:** Forest related humanistic and social scientific research is generally under-represented in the field of forestry, in spite of the disciplines deep interrelation with other fields. Forest practices and policies related to the general socio-economic development are, however, very interesting from the perspective oc social sciences. While forestry and silvicultural sciences focus predominantly on the technical aspects of tree planting, it was acknowledged already decades ago, that plantation forestry has very significant socio-economic and also political impacts, perhaps especially so in the developing world. It is therefore important to ask about the particular systems of knowledge that organize global plantation forestry, how these were changing and what are the dominant knowledge-systems influencing plantation practices today. The paper aims at showing the change in approaches to plantation forestry, with particular emphasis on tropical regions. Introducing the concept of a "paradigm", a set of historically changing assumptions, concepts, values, and practices that constitutes a way of viewing plantations, and directs plantation related policies, it traces the development of such structures of knowledge in the history of plantation forestry. A wide historical sketch of trends and milestones in plantation forestry accompanied by an analysis of World Forestry Congress documents (as the most graspable forum of what can be termed an "epistemic community" of plantation forestry), FAO archival documents and a content analysis of a sample of issues of the influential journal "Unasylva" were analyzed to show the evolution of meanings and associations of forest plantations. Based on a broad textual analysis, a classification of the "paradigms" (with "paradigm shifts") is proposed and discussed in relation to the understandings and impacts of plantations.

**Keywords:** FAO, paradigm, plantation forestry, tropics, Unasylva, World Forestry Congress

## 1. Introduction

Forest plantations are variously defined in the literature and even the standardized definition adapted by FAO has significantly changed over time (Carle and Holmgren 2003). The main shared characteristics of these definitions point to forested areas artificially established by planting or seeding. Other features are that the trees usually belong to the same species (native or introduced), have the same age structure and are regularly spaced (FAO 2006; FRA 2010).

While forest plantations are a phenomenon known for millennia, in the tropical context they have evolved significantly since the early colonization period. Planting activities associated predominantly with technical skills and silvicultural knowledge have been affected by ideational factors, norms, social context and the broader historical and economic developments. Although the humanistic and social scientific research on plantations has been recognized (important contributions already exist: Sargent and Bass 1992; Evans 2009; Evans and Turnbull 2009) it remains rather marginal and weak in theory-building, macro diagnosis and critical reflections.

Currently, forest plantations constitute 7% of the total global forested land cover and occupy about 268 million hectares (FRA 2010). The trend of permanent rapid increase of plantation area continues from the 1950s and is further expected to prevail in the coming decades (Sedjo 1999;

for scenarios see: Brown 2001). Additionally, plantation forestry in the South is very strongly nested on the political agenda due to the planted forests' carbon storage capacity as noticed in the climate change debate. New incentives such as the Clean Development Mechanism (CDM) afforestation/reforestation methodologies and the debated mechanism of Reducing Emissions from Deforestation and Degradation (REDD), emphasize plantations as a relatively cheap, clean and harmless means of emissions compensation (Moura-Costa and Aukland 2001).

## 2. Theoretical Background and Methodology

The theoretical concept of a *paradigm* (Greek for *pattern*) is defined as a set of assumptions, values, and practices that constitutes the way of perceiving reality shared by the community, especially in intellectual and scientific circles. Studying the scientific disciplines as organized by shared structures (paradigms) draws on the philosophy of Thomas Kuhn, who in his work „Structure of Scientific Revolutions" (1996 [1962]) pioneered the view of science not as stable and linear but subjected to *paradigm shifts*. According to Kuhn, research questions, available methodologies and shared assumptions within the scientific community lead to the accumulation of science under specific paradigms. As science is not stable, it experiences shifts when its role is redefined, new questions, perceptions and tools are adopted. Drawing on these assumptions, Handa (1986) introduced the concept of a *social paradigm* and stressed the social settings as influencing the paradigms. Both these approaches can be applied to forestry, which, as one scholar of forest ecology observed, "has always been changing as society changed the values it wanted" (Kimmins 2008: 1626). To the understanding introduced by Kuhn, Hall (1993) added the concept of a *policy paradigm* – pointing to the periods of continuity in policy terms punctuated by *paradigms shifts*, when the systems of ideas and standards are questioned and change policy directions. Acknowledging the different aspects of a paradigm shift, from scientific disciplines, the broader social context and reflected in the policy-making, I propose a set of key elements constituting a paradigm in the discipline of plantation forestry. They combine factors coming both from scientific considerations, as well as policy making, social structures and economic performance.

| Paradigms of Plantation Forestry | | | | | |
|---|---|---|---|---|---|
| Land Ownership Mode | Forest Management System | Understandings / Goals of Plantations | Governance / Outlook | Knowledge and Expertise Status | Capital Source and Production Potential |

*Table 1 – Proposed Elements Constituting a Paradigm in Plantation Research*

It is argued that change in several elements leads to a paradigm *shift*, while limited change can be considered as paradigm *evolution* and paradigm *stretching*.

Analyzing the paradigm change regarding forest plantations in the tropics requires a qualitative approach to trace the changes of meaning and the attributes connected to planting trees by different actors and over time. The methodology used to look for the changes in paradigm elements was interpretative and based on textual methods (discourse analysis and content analysis). After a historical background analysis of the milestones in plantation forestry, primary material was selected for further research to achieve sources triangulation and overcome a potential bias. Firstly, FAO archival documents regarding plantations were indicated and analyzed. Secondly the World Forestry Congress meetings, as the oldest continuous forum of what can be termed an "epistemic community" of plantation forestry (from 1926 onwards), was investigated, and changes in approaches traced in time. Lastly, a content analysis of a sample of

issues of the influential journal *Unasylva* aimed at checking the evolution of meanings and associations of forest plantations in twenty-year intervals.

## 3. Discussion: Paradigm Shifts in Tropical Forest Plantations

Based on the historical and textual analysis, certain paradigms constituting the way of organizing forest plantations have been identified, in conceptual coherence with the elements selected for paradigm identification (cf. Table 1). The table below (Table 2) shows the typology of eight paradigms, while in some cases paradigm evolution rather than shift may be observed (*industrial colonial* to *industrial national*; *neo-liberal* to *neo-liberal modified*). The last paradigm called *global political* lacks the hitherto conceptual coherence and due to its internal sub-divisions may be characterized as an example of paradigm stretching.

| PARADIGM | CHARACTERISTICS |
|---|---|
| **PRE-INDUSTRIAL** | Non-exclusive land ownership, community forest management, material and non-material services of plantations, micro scale, bottom-up outlook, local knowledge, low capital requirement, low production |
| **INDUSTRIAL COLONIAL** | Exclusive land ownership, centralization, land accumulation, forest management by designed authorities, economic goals, "progress"-discourse for justification, top-down outlook, Western scientific forestry knowledge, colonial enterprises, investments in valuable hardwood |
| **INDUSTRIAL POST-COLONIAL (NATIONAL)** | Exclusive land ownership, centralization, land accumulation, forest management by national forest departments, economic goals, "progress"-discourse for justification, top-down outlook, national scientific forestry knowledge from the West, state incentives, plantations of softwood and hardwood |
| **PROTECTIVE** | Non-exclusive land ownership, management by state forest administration, justified by protective functions of tree plantations, meso outlook, national scientific and local knowledge, national priorities, state capital or compensation, no or low production |
| **SOCIAL** | Non-exclusive land ownership regulated by communities, participatory forest management, "equitable growth" – discourse, horizontal governance, meso outlook, adapted technology transfer, multiple knowledge, agroforestry, community investments and external organization finance, moderate productivity due to multifunctionality |
| **NEO-LIBERAL** | Exclusive, private land accumulation, private management, profit maximization, top-down outlook, international scientific forestry, big private investments, multinational capital, high growth and productivity |
| **NEO-LIBERAL MODIFIED** | Exclusive land use without ownership, partnership agreements with farmers, management according to the outgrower schemes, profit maximization, constrained top-down outlook, international scientific forestry with possible local inputs, investments reduced by land costs, possible benefit-sharing, high growth and productivity |
| **GLOBAL POLITICAL** | Project dependent land ownership and management, political framing, scientific uncertainty, new disciplines beside forestry, global priorities, global/glocal scope:<br>UNFF: plantations for the global resources supply<br>UNFCCC: plantations to mitigate climate change<br>UNCBD: plantations to protect global biodiversity<br>UNCCD: plantations as means to combat desertification |

*Table 2: Plantation Paradigms – an Overview*

Tree plantations in the ancient times were limited due to the wide availability of natural forests. However, with the migration of peoples and due to particular functions of valued tree species (material services as medicine source or for fruits, but also non-material for cultural, aesthetic purposes) tree planting was a common practice (for example tree planting of Kayapo in Brazil's rainforest [Posey 2004: 21]). Ancient tree planting practices worldwide share many common properties as non-exclusive land use, community management, multipurpose functions, small scale and use of local knowledge. This form of plantation represents the *pre-industrial paradigm* and has been a common practice in the tropics until the colonization era, where a new paradigm was introduced.

Forest plantations on a larger scale and with a commercial purpose started in the global South in the $16^{th}/17^{th}$ century. The so called *industrial colonial paradigm* introduced by the colonial powers brought a new understanding of plantations role, scale, management etc. Firstly, plantations of hardwood species were developed for strategic purposes (as shipbuilding) and later for commercial use. The new paradigm introduced a restricted exclusive land use for tree planting with specially designed authorities responsible for plantation management. The vertical, top-down decision making scheme, introduction of Western scientific forestry knowledge delegitimizing the local traditional cognizance were important elements of the paradigm. Other was the way plantations were justified and explained to the local populations as a means to bring progress and economic development (Bryant 1996). The new plantations required much more initial capital investments but were also able to bring economic benefits for the colonial enterprises. In spite of the decolonization factor, plantation practices changed only slightly in the new independent states in the South. The new paradigm which can be called *industrial national* brought a new crucial actor for planting projects – the state, often providing strong incentives or organizing plantation by itself (van Bodegom et al. 2008; Bull et al. 2006). It was believed that plantation industry will foster national economy and development (Zaman 1967). The exclusive land ownership, vertical, top-down decision making scheme and Western knowledge have been maintained by the National Forest Departments. The first issue of the *Unasylva* journal reports on plantations in the context of state agencies and programmes and clearly marginalizes examples from the tropics (Unasylva 1947), the trend which reverses in all the other analyzed samples (Unasylva 1967; Unasylva 1987; Unasylva 2007).

As a counterbalance for industrial productive plantations and due to high deforestation, the *protective paradigm* could be observed. With the goal to use tree planting for soil, water, wind regulation and environmental services, new forms of forest plantations emerged. The *protective* paradigm intensified in the $20^{th}$ century with such examples as soil protection in many parts of Africa (e.g. Ethiopia), combating desert encroachment (predominantly countries bordering Sahara: Algeria, Libya, Morocco, Sudan) or flood protection (as China's reforestation programme). Protective plantations bring new justifications for planting, promote generally non-exclusive land use and balance central state planning with local functions. Investments in plantations are made by state and not aim at direct monetary goals but environmental services provided by plantations positively affect the country's wellbeing and economy in the long run.

Whereas the *protective* paradigm addressed environmental externalities, social failures similarly have been tackled by a new approach towards forest plantations, discussed as the *social paradigm.* A considerable ideational shift in the 1960s brought the "equitable growth" ideal, which had its reflections in plantation organization in the tropics. The World Forestry Congresses in the 1970s with the themes "forests and socioeconomic development" and "forests for people" clearly illustrate the ideational change from technocratic towards more "responsible" and socially-engaged forestry (Unasylva 1972, FAO 1978). The *social* paradigm partly returns to the *pre-industrial paradigm* by empowering local traditional knowledge, role of the communities in management, bottom-up decision making and horizontal governance. The investments in

plantations are made jointly by communities or financed by foundations, NGOs and other organizations. Plantations moderate productivity is compensated by multi functional goals and services for the local populations, as the FAO manual stresses: "forest plantations are made by farmers or by the community for the use and benefit of local population" (FAO 1987: 4).

Not long after the emergence of the *social* paradigm in forest plantations, global economic re-conceptualization according to the neo-liberal thought assured a big change in plantation actors and financing, especially in the developing world. The state, the previous leader promoting industrial plantations has been widely replaced by the private actors. And due to increased silvicultural technology and high growth rates in the tropics, many private transnational actors started to engage in plantation initiatives. The *neo-liberal paradigm* in plantations stressing "growth" in monetary terms promoted again exclusive land use, private management, top-down decision making, and international forestry knowledge. Huge private capital investments resulted in an extremely high productivity as the increment records from Brazil of $90m^3\ ha^{-1}\ year^{-1}$ (Evans and Turnbull 2009). But the social conflicts caused by such plantations lead to a new approach, the so called *neo-liberal modified paradigm*. It refers to constraints of the private companies and a need to limit land grabbing by establishing partnerships with local farmers, who remain landowners and can be contracted to plant trees (see: Race and Desmond 2001).

Lastly the new emerging paradigm in forest plantations is called *global-political* as it originates from the ideas of the international community present in international agencies and at global conventions, regarding the organization and justification of future plantations. It promotes project-management style of plantation projects and global priorities are negotiated between states, sectors and scientific disciplines (climatology, biology, soil science, hydro science, environmental economics). Knowledge and expertise are subjected to political framing and negotiations. Examples of such new views on plantations promoted from the international level include global wood resources supply and demand analysis and promotion of short rotation plantations (UNFF), carbon storage (UNFCCC), combating desertification (UNCCD) and biodiversity protection (UNCBD). This new paradigm lacks the intellectual coherence in ideas and visions plantations should play in the society, which was visible among its paradigmatic predecessors. It is stretched to incorporate new issues and sectors, but also reflects the complexity of current plantation policies.

## 4. Conclusions and Outlook

Forest plantations in the tropical context have largely been subjected to ideational impacts and changing socio-economic and political context. The powerful discourses of "progress", "economic growth" or "growth with equity" as well as other social norms (e.g. nature protection) or broader historical and economic development (colonization, decolonization, market liberalization, aid politics) are reflected in the changing paradigms of forest plantations. In the evolution of planting approaches paradigm shifts, paradigm evolution and paradigm stretching can be identified. Due to the current coexistence of several paradigms, the plurality may either foster dialogue or competition. The discursively powerful *global political paradigm* focused on plantations' role in climate change could destruct attention from the *social paradigm* and contribute to further marginalization of the local populations (Savenije and Dijk 2010: 67-8).

Studying plantation politics through the paradigm lens gives important insights into the changing perceptions of forest plantations in the tropics, their goals, actors and knowledge authorities. It offers a categorization of plantation types and diagnosis of the historical developments. However, such a macro research scope has its clear limitations such as the possibility of overlooking particularities of different countries and their experience with forest plantations. Similarly the paradigms indicate general characteristics and trends in plantation politics and may not be universally valid.

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