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# **Changing Paradigms in a Changing Climate: Analyzing the Political Economy of Tropical Forest Plantations**

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## Erklärung

Die Übereinstimmung dieses Exemplars mit dem Original der Dissertation zum Thema:  
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## TABLE OF CONTENTS

<b>CHAPTER 1 – INTRODUCTION AND RESEARCH DESIGN</b>	<b>1</b>
<b>1.1 Introduction: The Changing Climate for Plantations</b>	<b>1</b>
<b>1.2 Problems with defining forest plantations</b>	<b>4</b>
<b>1.3 Aim and structure of the study</b>	<b>6</b>
<b>1.4 Theory: Political Economic Approaches to Forestry</b>	<b>8</b>
1.4.1 Political economy’s field of investigation	8
1.4.2 Applications to forestry research	12
1.4.3 Theoretical approach in this study	14
<b>1.5 Research Design</b>	<b>18</b>
1.5.1 Theoretical framework	18
1.5.2 Goals and Objectives of the study	20
<b>CHAPTER 2 – METHODOLOGY</b>	<b>22</b>
<b>2.1 Overview of the methodology and data gathering techniques</b>	<b>22</b>
<b>2.2 Methodology in studying paradigm change</b>	<b>23</b>
<b>2.3 Methodology applied in case-studies</b>	<b>26</b>
2.3.1 Case selection	26
2.3.2 Data gathering for the comparative multiple case-study and MCA	30
2.3.3 Questionnaire design	32
<b>2.4 Methodological issues in integrating the levels</b>	<b>35</b>
<b>2.5 Methodology for alternative explanations to the paradigm concept</b>	<b>35</b>
<b>2.6 Research ethics</b>	<b>36</b>
<b>CHAPTER 3 – TROPICAL FOREST PLANTATIONS AND THE GLOBAL ECONOMY: FROM TIMBER TRADE TO CARBON OFFSETTING</b>	<b>37</b>
<b>3.1 Raw material for international markets</b>	<b>39</b>
<b>3.2 Adding value domestically: Shift in the role and scale of tropical plantations</b>	<b>42</b>
<b>3.3 From Rio until the present: Certification and carbon forestry?</b>	<b>46</b>
<b>3.4 Necessary expansion of plantations, uncertain impacts</b>	<b>50</b>
<b>3.5 From the political economy to the plantation paradigms</b>	<b>53</b>
<b>CHAPTER 4 – PLANTATION PARADIGMS AND A GLOBAL PERSPECTIVE ON FOREST PLANTATIONS</b>	<b>55</b>
<b>4.1 Roots and applications of the concept of a <i>paradigm</i> in forestry</b>	<b>55</b>
<b>4.2 Global political and social context for plantation forestry</b>	<b>57</b>
<b>4.3 Typology of Plantation Paradigms</b>	<b>60</b>
<b>4.4 Empirical application of the paradigm typology</b>	<b>69</b>
4.4.1 Country Case I: Paradigms and the development of plantations in Paraguay	69
4.4.2 Country Case II: Paradigms and the development of plantations in Indonesia	73

<b>CHAPTER 5 – PLANTATIONS FROM A LOCAL PERSPECTIVE: CASE STUDIES OF SELECTED PLANTATIONS FROM PARAGUAY AND INDONESIA</b>	<b>84</b>
<b>5.1 Plantation case studies in Paraguay</b>	<b>84</b>
5.1.1 Case study I: Smallholder plantation with development aid, San Pedro Department	84
5.1.2 Case study II: Smallholder plantation with Clean Development Mechanism (CDM), Paraguari Department	86
5.1.3 Case study III: Out-grower schemes in Itapúa Department	88
5.1.4 Case study IV: Enterprise POMERA, Alto Parana Department	90
<b>5.2 Plantation case studies in Indonesia</b>	<b>92</b>
5.2.1 Case study V: Community plantation through Community Forest Owners Association APHR, Wonosobo Regency, Java	92
5.2.2 Case study VI: State enterprise Perum Perhutani, Randublatung Reg., Java	94
5.2.3 Case study VII: Enterprise Musi Hutan Persada (MHP), Muara Enim Regency, Sumatra	96
<b>5.3 Multi-Criteria-Analysis of the plantation case studies</b>	<b>99</b>
<b>CHAPTER 6 – INTEGRATION AND DYNAMICS BETWEEN THE GLOBAL, NATIONAL, AND LOCAL LEVELS</b>	<b>104</b>
<b>6.1 Comparative analysis: Global paradigms and the local performance of selected plantations. Assumptions vs. Observations</b>	<b>104</b>
6.1.1 Industrial national paradigm reflected in Case study VI (Perum Perhutani in Randublatung, Indonesia)	105
6.1.2 Social paradigm reflected in Case study I (PMRN in Paraguay) and Case study V (Community Forest Owners Association in Indonesia)	108
6.1.3 Neoliberal paradigm reflected in Case study IV (POMERA in Paraguay) and Case study VII (MHP in Indonesia)	111
6.1.4 Neoliberal modified paradigm reflected in Case study III (Out-grower scheme in Itapúa, Paraguay)	115
6.1.5 Global political paradigm reflected in Case study II (CDM in Paraguay)	118
<b>6.2 Explaining divergences – on the unpredicted observations</b>	<b>121</b>
<b>6.3 Strengths and weaknesses of the studied paradigms</b>	<b>127</b>
<b>CHAPTER 7 – METHODOLOGICAL CHALLENGES AND ALTERNATIVE EXPLANATIONS</b>	<b>129</b>
<b>7.1 Methodological challenges of the paradigm approach</b>	<b>129</b>
<b>7.2 The paradigm concept and alternative explanations</b>	<b>130</b>
<b>7.3 Other limitations of the political economic research on plantations</b>	<b>133</b>
7.3.1 Problem with reliable data and changing plantation definitions	134
7.3.2 Problems of explorative research	134
7.3.3 Problems with indicator setting	134
7.3.4 Problem of single-case study dominance	135

<b>CHAPTER 8 – LESSONS LEARNED</b>	136
<b>8.1 Lessons from the global historical paradigm analysis</b>	136
<b>8.2 Lessons from the case studies</b>	138
8.2.1 Paraguay	138
8.2.2 Indonesia	140
8.2.3 Best practices from the local plantation case studies	143
<b>8.3 Conclusions</b>	150
<b>8.4 Outlook: The future political economy of tropical forest plantations</b>	154
<b>8.5 Next steps – identifying further research gaps and directions</b>	155
 <b>REFERENCES</b>	 157
 <b>ANNEXES</b>	
 <b>Annex to Chapter 3</b>	 178
3.1 Historical global plantations’ development with a focus on the species	178
 <b>Annex to Chapter 4</b>	 181
4.1 World Forestry Congresses 1926-2009: Snapshots on key issues in forestry, tropical forestry and plantations	181
4.2 Changing plantation discourse: a content analysis of <i>Unasylva</i>	193
 <b>Annex to Chapter 5</b>	 199
5.1 Steps of the MCA analysis	199
5.1.1 Data normalization table	199
5.1.2 Clusters of indicators used in the data analysis	202
5.1.3 Final synthetic index	204
5.2 Questionnaires	204
 <b>Annex to Chapter 6</b>	 208
6.1 Detailed Comparative analysis: Global paradigms and the local performance of selected plantations. Assumptions vs. observations	208
6.1.1 Comparative figures	209
6.1.2 Comparative analysis according to the paradigms	217
6.1.3 Summary of confirmed and unobserved elements	235
6.1.4 Correlation analysis	236

## LIST OF FIGURES

- Figure 1.1 – Political Economy of Forest Plantations: Aspects and Link to Paradigms
- Figure 1.2 – Theoretical framework
- Figure 1.3 – Overview of the research steps
- Figure 2.1 – Iterative research process in this study: Overview of steps and levels
- Figure 2.2 – Indicators Constituting a Paradigm in Plantation Research
- Figure 2.3 – Integration and dynamics between the levels of analysis
- Figure 3.1 – Changing plantation area with the most influential milestones of global forest plantation politics
- Figure 3.2 – Deforestation rate in tropical countries
- Figure 3.3 – Costs of wood (left) and costs for Bleached hardwood pulp (right), 2004, USD/t, total delivered cif West Europe
- Figure 3.4 – FSC-certified forest area between 1995 and 2008 – by region
- Figure 3.5 – Projected forest plantation area
- Figure 3.6 – Global timber commodity chain and the increase in profits
- Figures 5.1 – Socio-economic-environmental performance of plantation case studies in Paraguay
- Figures 5.2 – Socio-economic-environmental performance of plantation case studies in Indonesia
- Figure 6.1 (A) – Logic of reasoning
- Figure 6.2 (A) – Local involvement score on analyzed plantation
- Figure 6.3 (A) – Knowledge and expertise sources on the analyzed plantation
- Figure 6.4 (A) – Case Study I Smallholder Plantation with PMRN, Paraguay
- Figure 6.5 (A) – Perception of local plantation benefits by stakeholders in case study I
- Figure 6.6 (A) – Case Study II Smallholder Plantation with CDM, Paraguay
- Figures 6.7 (A) and 6.8 (A) – Perception of local and global plantation benefits by stakeholders in case study II
- Figure 6.9 (A) – Case study III Out-grower schemes in Itapua, Paraguay
- Figure 6.10 (A) – Perception of local plantation benefits by stakeholders in case study III
- Figure 6.11 (A) – Case Study IV Enterprise POMERA, Paraguay
- Figure 6.12 (A) – Perception of local plantation benefits by stakeholders in case study IV
- Figure 6.13 (A) Case study V – Community plantation through Community Forest Owners Association, Indonesia
- Figure 6.14 (A) – Perception of local plantation benefits by stakeholders in case study V
- Figure 6.15 (A) – Case study VI State enterprise Perum Perhutani, Indonesia
- Figure 6.16 (A) – Perception of national plantation benefits by stakeholders in case study VI
- Figure 6.17 (A) Case study VII – Enterprise Musi Hutan Persada, Indonesia
- Figure 6.18 (A) – Perception of local plantation benefits by stakeholders in case study VII
- Figure 7.1 – Results of group-average-link analysis
- Figure 7.2 – Results of principal-component-analysis
- Figure 8.1 – Lessons learned: an overview
- Figure 8.2 – Comparative results of stakeholder interviews in Cuatro Vientos and Choré

## **LIST OF TABLES**

- Table 1.1 – Plantation forest definitions
- Table 1.2 – Differences in the definitions of political economy
- Table 2.1 – Paraguay and Indonesia in comparison
- Table 2.2 – Plantation case studies assigned to the historical plantation paradigms
- Table 2.3 – Plantation case-studies in comparison
- Table 2.4 – Primary data collection at the local plantation level
- Table 2.5 – Primary data collection: national level
- Table 2.6 – Indicators for paradigm analysis
- Table 2.7 – Criteria and indicators for Multi-Criteria Analysis
- Table 3.1 – Labor demand in Brazilian forest plantations
- Table 3.2 – MAI by species according to different sources
- Table 4.1 – Paradigms in Plantation Forestry
- Table 4.1 (A) – World Forestry Congresses 1926-2009, Summary of key issues for paradigm categorization
- Table 4.2 – Emerging paradigms in Paraguayan timber plantations in comparison
- Table 4.2 (A) – Examples of the changing approaches regarding the role of forestry
- Table 4.3 – Milestones in Paraguayan timber plantation development
- Table 4.3 (A) – Overview of the plantation discourse in four snapshots based on the Unasylva
- Table 4.4 – Emerging paradigms in Indonesian timber plantations in comparison
- Table 4.4 (A) – Usages of the analyzed term in developed/developing/worldwide contexts
- Table 4.5 – Milestones in Indonesian timber plantation development
- Table 5.1 – Price categories for wood sold by POMERA
- Table 5.1 (A) – Data after normalization
- Table 5.2 (A) – Final synthetic index data
- Table 6.1 (A) - Brief characteristics of the industrial national paradigm in forest plantations
- Table 6.2 (A) - Brief characteristics of the social paradigm in forest plantations
- Table 6.3 (A) - Brief characteristics of the neoliberal paradigm in forest plantations
- Table 6.4 (A) - Brief characteristics of the neoliberal modified paradigm in forest plantations
- Table 6.5 (A) - Brief characteristics of the global political paradigm in forest plantations
- Table 6.6 (A) – Summary of the paradigm fit
- Table 6.7 (A) – Selected results from the correlation analysis
- Table 8.1 – Critical observations from the plantation paradigm analysis
- Table 8.2 – Improvement areas for the plantation environment in Paraguay
- Table 8.3 – Improvement areas for the plantation environment in Indonesia
- Table 8.4 – Social capital elements in comparison

## **LIST OF MAPS**

- Maps 2.1 and 2.2 – Location of plantation case studies



## LIST OF ABBREVIATIONS

ACIAR – Australian Centre for International Agricultural Research  
APHR – Community Forest Owners Association of Wonosobo (Indonesian: Asosiasi Pemilik Hutan Rakyat)  
APP – Asia Pulp and Paper  
APRIL – Asia Pacific Resources International Holdings  
A/R – Afforestation/Reforestation  
BRICS – Brazil, Russia, India, China and South Africa  
BUMN – Ministry of State Enterprises (Indonesian: Kementerian Badan Usaha Milik Negara)  
CDM – Clean Development Mechanism  
CER – Certified Emission Reduction  
cif – costs, insurance, and freight  
CIFOR – Center for International Forestry Research  
CSIRO – Commonwealth Scientific and Industrial Research Organisation  
DITSI – Directorate of Reforestation and Greening (Indonesian: Direktorat Reboisasi dan Rehabilitasi Lahan)  
EFI – European Forest Institute  
EIA – Environmental Impact Assessment  
FAO – Food and Agriculture Organization  
FONASO – Forest and Nature for Society  
FORDA – Forest Research and Development Agency (Indonesian: Badan Penelitian dan Pengembangan Kehutanan)  
FRA – Forest Resources Assessment  
FSC – Forest Stewardship Council  
GDP – Gross Domestic Product  
GIS – Geographic Information System  
GMO – Genetically Modified Organism  
GPE – Global Political Economy  
GTZ/ GIZ – German Development Agency (German: Deutsche Gesellschaft für Technische Zusammenarbeit/ Deutsche Gesellschaft für Internationale Zusammenarbeit)  
HTI – Industrial Timber Plantation (Indonesian: Hutan Tanaman Industri)  
HTR – People Plantation (Indonesian: Hutan Tanaman Rakyat)  
IDR – Indonesian Rupiah  
IFC – International Financing Corporation  
IFF – Intergovernmental Forum on Forests  
ILO – International Labor Organization  
IMPF – Intensively-Managed Planted Forest  
INFONA - National Forestry Institute (Spanish: Instituto Forestal Nacional)  
IPB – Bogor Agricultural University (Indonesian: Institut Pertanian Bogor)  
IPCC – Intergovernmental Panel on Climate Change  
IPE – International Political Economy  
IPF – Intergovernmental Panel on Forests  
IRR – Internal Rate of Return  
ISEAL -International Social and Environmental Accreditation and Labelling  
ITTO – International Tropical Timber Organization  
IUFRO – International Union of Forest Research Organizations  
JIRCAS – Japan International Research Center for Agricultural Sciences  
JPP – Superior teak clone ( Indonesian: Jati Plus Perhutani)  
KfW –Reconstruction Credit Institute (German: Kreditanstalt für Wiederaufbau)

KPH – Forest Management Unit (Indonesian: Kesatuan Pengelolaan Hutan)  
 LEI – Indonesian Ecolabelling Institute (Indonesian: Lembaga Ekolabel Indonesia)  
 LIPI – Indonesian Institute of Science (Indonesian: Lembaga Ilmu Pengetahuan Indonesia)  
 MAI – Mean Annual Increment  
 MCA – Multi Criteria Analysis  
 MHP – Musi Hutan Persada (company)  
 MHR – People Forest Management (Indonesian: Menanam Hutan Rakyat)  
 MHBM – Community Based Forest Management (Indonesian: Menanam Hutan Bersama Masyarakat)  
 MNC – Multinational Corporation  
 NBSK – Northern Bleached Softwood Kraft  
 NGO – Non-governmental organization  
 NTFP – Non Timber Forest Products  
 PEFC – Programme for the Endorsement of Forest Certification  
 PHBM – Managing Forest with the Community Scheme (Indonesian: Pengelolaan Hutan Bersama Masyarakat)  
 PMDH – Forest Village Community Development (Indonesian: Pembangunan Masyarakat Desa Hutan)  
 PMRN – Project for Sustainable Management of Natural Resources (Spanish: Proyecto de Manejo Sostenible de Recursos Naturales)  
 PP – Perum Perhutani  
 PYG – Paragayan Guarani  
 REDD – Reducing Emissions from Deforestation and Degradation  
 SFM – Sustainable Forest Management  
 SPSS – Statistical Package for the Social Sciences  
 SVLK – Timber Legality Verification System (Indonesian: Sistem verifikasi legalitas kayu)  
 TFAP – Tropical Forestry Action Plan  
 UCBT – Union for Trade in Tropical Timber (French: Union pour le Commerce des Bois Tropicaux)  
 UN – United Nations  
 UNA – National University of Asunción (Spanish: Universidad Nacional de Asunción)  
 UNCBD – United Nations Convention on Biological Diversity  
 UNCCD – United Nations Convention to Combat Desertification  
 UNDP – United Nations Development Programme  
 UNEP – United Nations Environment Programme  
 UNFCCC – United Nations Framework Convention on Climate Change  
 UNFF – United Nations Forum on Forests  
 USD – United States Dollar  
 VOC – East India Company (Dutch: Vereenigde Oostindische Compagnie)  
 WB – World Bank  
 WFC – World Forestry Congress  
 WHO – World Health Organization  
 WWF – World Wildlife Fund  
 WRI – World Resources Institute

## SUMMARY

This study analyzes the political economy of forest plantations in the tropics. The initial macro-level part provides a global outlook and an historical analysis of the changes in paradigms regarding forest plantations. The second part brings micro-level evidence from different kinds of plantations in different geographical contexts, namely Paraguay and Indonesia. Case studies represent a diverse spectrum of forest plantations (illustrating paradigms derived from the macro level analysis). Finally, the study combines macro-level developments with micro evidence and considers lessons learned for future plantation establishment.

Research methodology is adapted to different levels of investigation in an iterative process. Moving the scope from macro to micro and from theoretical to empirical levels. On the macro level a political economic analysis and the study of relevant historical material are carried out and plantation paradigms are delimited based on selected indicators. On the micro level, methodology used in case studies involves field surveys and interviews that provided data for a Multi Criteria Analysis. Integration of the two levels builds on data from both parts, supported by a discussion and correlation analysis.

The research outcome from the global analysis is a typology of **six main paradigms** and their sub-variations that can serve as a theoretical and analytical tool in plantation research. The paradigms are classified as: i) preindustrial; ii) industrial colonial and industrial national; iii) protective; iv) social; v) neo-liberal and neo-liberal modified and vi) global political.

The results of the case studies and MCA analysis warn against visible shortcomings presented in plantations organized under different paradigms and shed light on positive effects that certain plantation paradigms may have. The MCA evaluation points to paradigms that correlate with land conflict, shows different local involvement levels on various plantations, illustrates benefits that plantations are bringing for different stakeholders. MCA analysis of the case studies evaluates the economic performance of plantations and looks in detail on benefit distribution, profitability, market access and the general environment for investments. It analyzes the social factors ranging from work safety, access to services, participation or human resources situation. Also various environmental issues are tackled by the study, with land use change, water or soil impacts, habitat function etc. As the comparative analysis shows, **the neoliberal modified paradigm plantation (outgrower-schemes) proved particularly suited to assure both social and economic benefits (90% and 84% scored in the respective fields, while contrasted with a hypothetical ideal-type plantations)**. Other research results point to important lessons in plantation development, that should be considered on the plantation level and while designing national frameworks for the plantation sector. Lessons for the forestry epistemic community in shaping global plantation discourses are also discussed.

### Key-words:

forest plantations, paradigm, paradigm change, political economy, history of plantations, Paraguay, Indonesia, MCA

# **Chapter 1 – Introduction and Research Design**

This chapter provides a brief introduction to the developments in plantation related research and practice and discusses the research design of this study. It is divided into four main subchapters dealing with the directions in plantation research (1.1) and problems of forest plantation definitions (1.2). It moves later to the goals and structure behind this investigation (1.3). Further it positions its insights in the field of political economy (1.4) and provides an overview of the research design, with the theoretical framework, goals and scientific objectives and research questions (1.5).

## **1.1 INTRODUCTION: THE CHANGING CLIMATE FOR PLANTATIONS**

Forest related humanistic and social scientific research was underrepresented in the field of forestry for many years in spite of the latter's deep interrelation with other disciplines. However, forest practices and policies related to the general socio-economic development are very interesting from the perspective of social sciences. Since the mid-1970s, social sciences other than economics have begun to influence the field of forestry, on both the analytical and practical level. Anthropology and sociology entered the debate in the 1980s with the emphasis on property rights, studies of social structures, access rights and conflicts over forest resources to name a few (Smouts 2003). The last decade brought a significant change and advancement of social scientific inputs to the field of forestry. Interdisciplinary work has been promoted for example by the Center for International Forestry Research (CIFOR) and some research areas became well integrated into multidisciplinary approaches such as the governance research conducted by Elinor Ostrom (1986, 2000a, 2000b), political ecology school in forestry (Bryant 1997, Tuk-Po *et al.* 2003, Gerber *et al.* 2009), studies of forest use conflicts (Gritten *et al.* 2009, Gerber 2010) or research on social capital in forest management (Gong *et al.* 2010, Kanowski *et al.* 2011, Ostrom and Ahn 2003, Smith *et al.* 2012) are among the new schools illustrating this trend. Similar trends are discernible in plantation forestry where plantation research goes beyond the technical aspects of tree planting and has very significant socio-economic,

environmental and also political impacts, perhaps especially so in the developing world (Sargent and Bass 1992).

The area of plantations is considered to steeply rise in the near future (EFI 2013), and “their fate depends on the future patterns of interaction between the national and international and between economics and politics, at both the local and world levels, the very definition of international political economy” (Smouts 2003: 121).

There is no doubt that planted forests can provide a variety of economic, social, cultural and environmental services and benefits. Van Bodegom *et al.* list provisioning services (supply of products/goods, labor generation, contribution to rural development), regulating services (air quality regulation, climate regulation, waste treatment, water regulation, erosion prevention), cultural services (aesthetic, recreational, spiritual, educational) and supporting services (habitat functions, refuge, nursery, nutrient cycling, water cycling (2008: 6-7)).

Particularly now, plantation forestry is on the political agenda once again. In recent years the broad significance of plantations has been recognized internationally (Carle and Holmgren 2008). This is due to both the traditional functions of forest plantations: provision of wood and biomass among other economic services, as well as the recent discussions of climate change mitigation and adaptation linked to new possibilities available to finance plantations. These include the Clean Development Mechanism (CDM) and the emerging Reducing Emissions from Degradation and Deforestation and Enhancing of Carbon Stocks (REDD+) (Scheyvens and Lopez-Casero 2009),<sup>1</sup> where plantation forestry is perceived as a relatively cheap, clean and harmless means of emissions compensation (climate change mitigation function). However, while the question of natural and planted forests is broadly discussed within this new

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<sup>1</sup> Plantations have recently gained attention due to their carbon storage capacity. The first project involving tree planting and incorporating carbon storage objective took place in Guatemala in 1989 (Evans and Turnbull 2009: 23). Further at the beginning of the 1990s the Dutch Electricity Company invested in plantations to absorb carbon equivalent of its emissions (Ibidem). With the Kyoto Protocol from 1997 plantations received more legitimization at the global level and afforestation and reforestation have been incorporated under the CDM mechanism. As forestry projects were weakly represented under the CDM, in 2005 a new and still widely tested mechanism to reduce emissions through forestry project called REDD have been established. However, it still is uncertain to what extent and with what results plantations in the tropics will be used in carbon offsetting. The 2013 Warsaw COP-19 decision on national forest monitoring systems for the REDD mechanism enables the governments to define “forests” on their own. Measures agreed in Cancun preventing the conversion of “natural forests” were substantially weakened by this Warsaw decision. It allows including not only timber plantations in general but particularly fast growing exotic tree plantations, oil palm estates or even temporary clear-cuts in the REDD mechanism, as different types of “forest” (REDD-monitor 2013).

debate, the main focus is on the calculation of ‘carbon credits’ or the notion of ‘additionality’. Much less attention is given to such problems as the socio-economic sustainability of forest plantations (cf. Morrison and Bass 1992), or the fundamental questions of their political economy. Although ‘carbon forestry’ and ‘carbon plantations’ remain a rather limited phenomenon, with only marginal impact on the global plantation sector, it is visible that even in this new and wide debate lessons from past experiences are not drawn properly.

Some critical voices on plantation development came from the civil society. Many NGOs called for excluding monoculture tree plantations from financial support to forest and climate change-related programs because of their negative environmental and social impacts. From a climate change mitigation perspective, it is feared that the expansion of forest plantations will increase rather than decrease greenhouse gas emissions (especially if the broader scenario is considered with plantations’ impacts on forests and other ecosystems and the adverse effects of the pulp and biomass industry). It was estimated that plantations store only about 20% of the carbon stored in old growth forests (Global Forest Coalition 2014). A different debate, driven especially by international NGOs focuses on the possible new role of plantation forestry in adaptation to dangerous climate change – which is linked to older ideas of poverty eradication, increasing community resilience, and local environmental services of planted forests. From the climate change adaptation perspective, adaptation strategies are, on the other hand, easier to implement in forest plantations than in natural stands. Adaptation measures include changes in land use, different management intensity, species selection, harvesting patterns, changes in rotation periods, shifting to species more productive under the new climatic conditions, landscape planning etc. (Spittlehouse and Stewart 2003).

Environmental implications of plantations are more and more often framed in global (climate change mitigation) rather than local (impacts on biodiversity or the local ecosystems etc.) terms. Historic experiences, especially those of spectacular failures of large-scale industrial plantations of 1960s and 70s, seem to be teaching a rather harsh lesson (Sargent and Bass 1992).<sup>2</sup> While public opinion in the developed world is likely to support the *idea* of plantations, seeing them as countering deforestation and applauding their role in climate change mitigation, local realities in many developing countries often tell a different story (Karumbidza and Menne 2009). Local

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<sup>2</sup> In many cases tropical forest plantations have proven largely unsustainable and unprofitable. “[D]espite rapid initial growth, many tropical plantation forests have not fulfilled their early promise and a number of significant problems have arisen” (ITTO 1993: 1)

needs are rarely understood and addressed by external plantation initiatives and large centralized plantation investments, predominantly for energy purposes, are linked to the global phenomenon of land grabbing (Kröger 2012). Large-scale land deals of agricultural and non-edible crops proliferate and create post-colonial dependencies.

Before the detailed scope of the study is presented, it is necessary to identify the object of the study – forest plantations. As the term is widely subjected to interpretation, the next subchapter looks at the different definitions and their common and diverging elements.

## **1.2 PROBLEMS WITH DEFINING FOREST PLANTATIONS**

Any plantation related research and especially a historically rooted and global approach faces the methodological and practical problem regarding plantation-related definitions. These vary significantly among countries, institutions and change over time (Evans *et al.* 2009). For this reason many planted forests in Europe, almost all of the forests of Denmark or even the New Forest in the United Kingdom and parts of the German Black Forest, appear natural with little sign of their planted origin and are officially not treated as forests plantations (Evans 2009b: 200). These and other similar definition struggles lead to biased statistics and make it very difficult to assess, compare and analyze plantations in a macro approach.

It is commonly understood in the literature that forest plantations are:

- forest stands established artificially by afforestation on land which previously did not carry forests;
- or forest stands established artificially by reforestation on land which carried forest within the previous 50 years or within living memory and involving the replacement of the previous crop by a new and essentially different crop.

There are, however, many nuances that vary in the definitions of forest plantations. The table 1.1 listed below illustrates a sample of possible approaches. It is visible that there are inclusive or exclusive definitions and that various authors and institutions put different emphasis in the delimiting process.

There are many diverse types of plantations that vary in management intensity and practices with short-rotation industrial plantations and close-to-nature plantations as two extremes. Plantations are established for different purposes (productive, protective, multipurpose) and may create forested land when it historically existed (reforestation) or did not exist in the previous 50 years or within the living memory (afforestation). Data differences refer to the vague distinction between planted forest and semi-natural forest and adopted definition of plantation forest itself. As the table 1.1 shows the definitions vary not only in national contexts and among various authors, but even the vocabulary used by the FAO Global Forest Resources Assessments since 1980s has evolved significantly.

Source	Definition of Plantation Forest
FRA 1980/ FRA 1990	Forest stands established artificially by afforestation on land which previously did not carry forest; and forest stands established artificially by reforestation on land which carried forest within the previous 50 years or within living memory and involving the replacement of the previous crop by a new and essentially different crop (FRA 1980 in: Carle and Holmgren 2003).
FAO 1998	Forest stands established by planting or/and seedling in the process of afforestation or reforestation. They are either: i) of introduced species (all planted stands) or; ii) intensively managed stands of indigenous species, which meet all the following criteria: one or two species at plantation, even age class, regular spacing (FAO 1998 in: REHAB 2003).
Siyag 1998	A large group of trees planted in a tract of land, usually fenced or delineated with a boundary. Planting of nursery raised seedlings is necessary to supplement the natural vegetation growth, esp. in arid and semi-arid areas (Siyag 1998 in: REHAB 2003).
FRA 2000	Forest stands established by planting or/and seeding in the process of afforestation or reforestation. They are either of introduced species (all planted stands), or intensively managed stands of indigenous species, which meet all the following criteria: one or two species at planting, even age class, regular spacing. New plantation forests were defined as afforestation for artificial establishment of forest on lands which previously did not carry forest within living memory or the past 10 years; and reforestation for artificial establishment of forest on lands which carried forest before (FRA 2000).
FAO 2001	A forest established by planting or/and seeding in the process of afforestation or reforestation. It consists of introduced species or, in some cases, indigenous species (FAO 2001 in: REHAB 2003).
UNEP/CBD/SB STTA 2001	A plantation forest may be afforested land or a secondary forest established by planting or direct seeding. A gradient exists among plantation forests from even-aged, single species monocultures of exotic species with a fibre production objective to mixed species, native to the site with both fibre and biodiversity objectives. This gradient will probably also reflect the capability of the plantation forest to maintain "normal" local biological diversity. (UNEP/CBD/SBSTTA 2001 in: REHAB 3003).
ITTO 2002	Forest stand that has been artificially established by planting or seeding (ITTO 2002).
Zhang and Owiredu 2007	Forest stands raised artificially (Zhang and Owiredu 2007) .
FRA 2010	Forest predominantly composed of trees established through planting and/or deliberate seeding. Planted forest of introduced species ( <i>sub-category</i> ) Planted forest, where the planted/seeded trees are predominantly of introduced species (FRA 2010).
UNFCCC 2008	Within the CDM-specific framework for reforestation projects, it has to be demonstrated that the area to be reforested was not a forest on December 31, 1989. For afforestation projects – that the vegetation on the land to be afforested has been below the thresholds of the country-specific forest definition for at least fifty years before the project's start date (Scholz and Jung 2008). The transformation of natural forest into industrial plantations after rounds of logging is considered to occur fully within the "forest" category.

**Table 1.1** - Plantation forest definitions (Source: own elaboration)



All the definitions stress artificial establishment of planted forests and so plantation forests are always defined in relation to human intervention necessary to their establishment and management. But there are also significant differences that can be observed. Some definitions introduced a different time factor for afforestation (no forest cover in the previous 50 years in FRA 1980 and 1990 vs. 10 years in FRA 2000) or add criteria which are not present in other definitions regarding species, management, age class or spacing. The newest FRA definition is very inclusive and keeps the two subcategories of indigenous and introduced species.

Due to the historical scope of this study, it is based on the inclusive definition of forest plantations (Zhang and Owiredu 2007).

### **1.3 AIM AND STRUCTURE OF THE STUDY**

This work aims at offering a theory-driven plantation diagnosis and reflection on historical forest plantation developments in the tropics and subtropics. It also looks at examples on how plantations are organized and what social, economic and environmental roles they have on the ground. It applies a historical political economic approach to study global plantation developments as well as specific national contexts for the selected country case studies. It looks at the political and economic forces at global and national levels and investigates environment and socio-economic impacts of plantation forestry on local populations. It deals with power, manifested in the access to land and resources, as well as the distribution of plantation benefits, one of the core problems of political economy. Such questions, when asked in the context of the developing world, also add a critical edge to the research. Finally, it deals with knowledge structures that organize plantation initiatives and attempts to make a link between global political economy, different forms of knowledge and local plantation performance by introducing the concept of plantation “paradigms”.

The study is divided into eight chapters. The remainder of this Chapter (1) gives an overview of the literature on political economy, which is relevant as the theoretical background for this research. It maps the different approaches and explains how the present study fits into this tradition. Next, the theoretical framework, goals and the research objectives are introduced.

Research chapters are supported by annexes, providing additional data, figures or in-depth information on the methods used in the study.

*Chapter 2* discusses the methodology of the entire study. Its subchapters introduce the methodological apparatus and data gathering techniques used for different research steps.

*Chapter 3* provides a general introduction to the role of tropical forest plantations in global political economy. It traces the rapid expansion of plantations in the 20<sup>th</sup> century along most significant policy milestones and in three economically distinguishable phases: with plantations as the source of raw material, attempts to extend the domestic value added chains in tropical countries and the recent shifts on global markets. It ends with a conclusion signaling current and emerging problems, which require a deeper reflection of knowledge structures that organize plantations globally. The Annex to Chapter 3 traces the changes in dominant tree species used in tropical forest plantations.

*Chapter 4* offers a historical perspective on global political economy and the development of plantations by introducing the concept of a *paradigm*. It traces the World Forestry Congress meetings, FAO archival materials, articles from the *Unasyuva* journal and in an inductive reading of this corpus of texts introduces the general typology of six major paradigms in forest plantations (and several sub-variants). These are then applied to study the forest plantation experiences in Paraguay and Indonesia. Annex to Chapter 4 provides a detailed analysis of the WFC meetings and *Unasyuva* journal for paradigm delimitation.

*Chapter 5* contains the comparison of two different developing countries: Paraguay and Indonesia. They represent two divergent categories of respectively subtropical and tropical states – emerging producers with visible but underdeveloped potential for tree planting and processing and large timber producers with a significant impact on the global market. In this chapter the scope shifts to the local level, where a Multi Criteria Analysis (MCA) of several plantation cases is conducted. These case studies illustrate different kinds, and, as the applied theoretical framework suggests – different paradigms of plantations. In an iterative manner, the inductively derived paradigm typology is applied to analyze real-life ongoing plantation cases. This is conducted, using different social, economic and environmental criteria and indicators. The Annex to Chapter 5 gives some additional details on the MCA and the normalization of the data for comparison and lists the questionnaires used in the field research.

*Chapter 6* integrates the different levels of analysis: global, national and local, and confronts the assumptions from the desktop analysis (Chapter 4) with field observations (Chapter 5). Theory-derived assumptions are contrasted with empirical observations, and an attempt is made to explain the convergences and divergences. The integration results are explained in detail in Annex to Chapter 6.

*Chapter 7* discusses the methodological challenges of the study. It looks at alternative explanations to the paradigm concept. Subsequently it categorizes limitations encountered in this research project.

*Chapter 8* introduces lessons learned from the global analysis and case study research. They are presented as lessons learned from the paradigm analysis and lessons from the case studies. It ends with conclusions and outlook and identification of further research gaps.

As already signaled, specific annexes to the chapters (3, 4, 5 and 6) allow for a better understanding of the research process and possible replication and further use or modification of the approach.

## **1.4 THEORY: POLITICAL ECONOMIC APPROACHES TO FORESTRY**

### **1.4.1. Political economy's field of investigation**

Political economy is a broad approach that may imply very different meanings to different authors. The table 1.2 below illustrates some of the possible definitions of the concept. The most important distinction is between political economy as a theoretical or methodological approach and as an area of study.

The classical definition of the term was addressing the management of the economic affairs of the state (Caporaso and Levine 1992: 1). Until the advent of neo-classical economics in the 20<sup>th</sup> century, the discipline was referred to as 'political economics' or 'political economy' meaning what we now understand as economics (Söderbaum 2000:7). In its classic theoretical sense, the

concept was almost identical with macroeconomic analyses and reflections on international trade. However, as critics point out, this classical version of “political economy” – of Adam Smith or David Ricardo – has “comparatively little interesting to say about such important socioeconomic questions as the distribution of wealth and income” (Nell 1980: 20). Furthermore, despite the name, political and institutional factors were almost absent, and economic theory tried to demonstrate that a well-oiled market mechanism will produce the most efficient allocation of resources among competing parties (Ibidem: 19).

**Table 1.2** - Differences in the definitions of political economy (Source: own elaboration)

<b>Theoretical / methodological approach</b>
Classical - <i>Political economy as the management of the economic affairs of the state</i> Blaikie and Brookfield 1987 - <i>[...] concerned with the effect of on-going changes within society at local and global levels on people and on their productive activities</i> Walter and Sen 2009 - <i>not any particular approach or tradition but an attitude to social science that does not privilege any single category of variable, whether political or economic</i> Tanner and Allouche 2011 - <i>[...] the processes by which ideas, power and resources are conceptualized, negotiated and implemented by different groups at different scales</i>
<b>Political economy as area of study: Different schools and their focus</b>
Institutional economic approaches, i.e. “Freiburg School” or “Ordoliberalism” - <i>Deals with the impact of political institutions and the quality of governance on the market and the functioning of the economy</i> “Socio-economics” in political economy - <i>Brings social and policy-related variables, offers normative and ideational explanations</i> International Political Economy (IPE) - <i>Studies the division of labor in the global economy, deals with inequality and interdependence</i> Historical International Political Economy - <i>Analyzes social practices, social order and change</i> Global Political Economy (GPE) - <i>Challenges the North/Western centric focus, critical perspectives</i> Environmental economics - <i>Looks at environmental problems as market externalities</i> Ecological economics - <i>Builds on the market approach but is not dogmatic and solution oriented, allows pluralist approaches</i> Political ecology - <i>Criticizes the status quo and calls for change</i>

Over the course of the 20<sup>th</sup> century ‘political economy’ has had many contradictory meanings (Weingast and Wittman 2008). The concept evolved over the centuries and today it is a complex framework open for both political and economic variables (Walter and Sen 2009: 4). It is driven by a plethora of factors, combining the realms of policy and economy. A political-economic

analysis necessarily implies a system of specialization and mutual dependence, and encourages thinking in terms of global markets and international systems of influence and production (Levine 1995: 148). Blaikie and Brookfield point out to the international dimension, very important in the domain of tropical forestry. With the increasing effects of globalization, political and economic shifts influence actors in different localities and at different levels of governance.

Political economic work may be classified in schools that share some common assumptions in defining the concept and conducting research. Economic analyses presuppose the existence of an effective state (Besley and Persson 2011), but they rarely address this institutional and political dimension. Classical political economy is focused on ideal economic situations which are far flung from political realities. In a discussion of tropical developing economies there is a need to look at other factors besides pure macro-economic analyses: institutions, politics and policy, social structures and the sources of inequality/asymmetry in the capitalist global economy. All these factors have been addressed by the different approaches and schools jointly labelled “political economy” or “political economics”.

Institutional economic factors relate to the impact of political institutions and the quality of governance on the market and the functioning of the economy. This was explicitly tackled from the 1930s by the so called “Freiburg School” or “ordoliberalism” of Walter Eucken and his disciples. The Ordoliberals proposed a normative view of the market order, as a non-discriminating, privilege-free order of competition. They also described the negative political dynamics that emerge where governments and legislators are empowered to grant privileges to special interest groups (Vanberg 2004: 15). Institutional economic approaches can also have critical or Marxist roots, but they share the emphasis on the role of state intervention and regulation of the market – or the possibility of market failures if institutions are badly organized or lacking.

Within the domain of political economy, approaches tend to be set between the poles of economics and sociology, usually providing a mix of both in different degrees. Sociological approaches tend to adopt an institutional level of analysis, treating economic conditions as both the context and the result of institutional, social and policy-related variables. One of sociology’s most original contributions to the international political economy literature is, according to Campbell, to offer normative and ideational explanations. Sociologically oriented scholars have

also examined the political, economic, and institutional conditions under which certain sectors perform better or worse across the world (2010). It is therefore a variant of what Smouts (2003) calls “socio-economics” in political economy.

The next focus of investigation after the state level is the international system. For years, this was the domain of International Relations scholars who focused on political factors alone. Only in the 1970s studies of dependence and interdependence, together with the shock of the 1973 oil crisis, led to refocusing on international political economy (IPE) – the “politics of international economic relations” (Oliver 2010). It constituted a return to the roots of classic political economy, but this time – with a lot of experience from policy studies and institutional theory. It was acknowledged that the division of labor in the global economy creates international inequality, which develops in a context of interdependence (Keohane and Nye 1977). Asymmetries in interdependence are “important both economically and politically. Economically, they make one country or group of countries sensitive to economic policies and economic cycles in other countries [...]. Politically, asymmetries create power relations between countries and vulnerabilities open to political exploitation” giving those less dependent power over those more dependent (Levine 1995: 129).

However, due to its focus on international institutions and inter-state relations, as well as a methodological approach favoring statistical modelling and macro studies, IPE was not able to grasp the interaction between local, national and international levels. It also had little social or environmental components. New research that evolved from this approach was termed “Historical International Political Economy” and is characterized by a concern with “structured social practices, social change [...] and social orders” as the main categories of interest (Langley in: Oliver 2010).

IPE was also dominated by American scholars writing from the perspective of the North and implicitly accepting the capitalist world order. Political economic analyses which were developing outside the US and the “West” were a challenge to this dominant perspective. Looking at global economic inequalities persistent in the capitalist division of labor, dependency theorists (many coming from Latin America) directed the attention at the patterns of exploitation between the developing and the developed world. The seminal work in this strand is Baran’s “Political Economy of Growth” (1957). While dependency theory stressed the economic sources of inequality, Wallerstein and other “world system theorists” argued that

political relations are just as important (Campbell 2010). The development of critical perspectives in IPE has brought with it interpretations drawing from Marx, Gramsci, Polanyi, Schumpeter and poststructuralism (Bruff *et al.* 2011: 1). The latter were the first to note that “the production of knowledge in and about the global political economy (GPE) is both socially useful and intellectually significant” (Griffin 2011: 43).

The new picture of critical IPE is intended “precisely as *political economics*”, as a critique of the capitalist socioeconomic system (Nell 1980: 26). While most of critical political economy draws on Marxist inspirations, the last important offshoot of this approach takes environmental and cultural problems to the core of its research. Environmental economics and ecological economics stress the quantitative dimension of natural resources use. While for environmental economics, ecological problems are only market externalities, ecological economics offers more pluralistic approaches and solutions in their analysis. In combining these environment-oriented approaches and a more social focus, political ecology and human ecology have developed their research agendas (cf. Newell 2012, Rudel 2009).

#### **1.4.2 Applications to forestry research**

Tropical forestry and the plantation sector in particular have been strongly influenced by market-oriented economic reasoning. Economy was the first social science to get recognized in the field. As Gale (1998: 112) points out, a market approach has its limits. Over a longer term, there are “simply too many variables to be controlled to ensure [...] the most 'economic' use of forested land.” These variables include technical and silvicultural aspects, property rights, macro-economic cycles, cultural shifts, political instability or institutional failure. For a number of years now the importance of this diverse array of variables in tropical forestry has been acknowledged.

Political economy has already been widely applied in the context of forestry and various authors have been successful in using these theoretical frameworks to study forest resources’ historical use, with various actors involved, and differentiated factors coming from national and global realms (as examples see: Nadkarni *et al.* 1989, Peluso 1991, Khan 1998, Guha 2000). Three monographs standing out in this respect are Gale’s (1998) analysis of the timber trade regime, Smouts’ (2003) politics of global deforestation, and Dauvergne and Lister’s (2011) global political economy of timber.

Some authors successfully applied a political economic approach to detailed diagnostic research with a direct problem-solving component. These aspects are now typically studied by scholars working on governance. Peluso and Poffenberger (1989) described the process of assisting the Indonesian state forestry agency in implementing pilot social forestry projects. They studied political and economic factors, including very problematic indicators as the dynamics of bureaucracy or social context. Their experience points to the importance of social scientists to build cooperation between bureaucracies and rural communities, bring scientific evidence on empowerment of the forest communities, their participation in research management, and the role of decentralization. In a different study Peluso (1991) offers a more critical analysis of forest practices in Indonesia with a historical focus. The analysis combines important political factors (colonial legacy, institutional factors, actors and power struggles, dominant discourses and philosophical orientation) with economic ones (indicated by profits, access to resources, labor etc.). Similar critical-historical studies, which merge political economic research with an engaged attitude, have been produced on Burma (Bryant 1996, 1997).

The single most important political economic analysis of the specific subject area of tropical forest plantations is “Plantation Politics - Forest plantations in development” edited by Sargent and Bass (1992). The editors focus on the issue of plantation politics looking for global patterns in plantation efforts supported by local evidence coming from all over the world. Various authors contribute chapters, which touch political, social, economic and environmental aspects related to tree planting. They discuss the market complexities, economic, political and social factors (tariff, trade barriers and consumer boycotts) along with national and international politics and local social and environmental realities. Even after 20 years the book is still the most valuable research on the politics of forest plantations in the tropics, although the economic data are by now visibly outdated. Other studies on tropical forest plantations maintaining a broad perspective and interdisciplinary awareness may also be identified (Boyle *et al.* 1999, Evans and Turnball 2009) but they usually concentrate either on technical or on theoretical issues. Political scientists, although they tackle economic questions in their research, deal to a large extent with theorizing the global forestry governance and rule-making (Chan and Pattberg 2008, Humphreys 1996, Mert 2009, Pattberg 2005, Werland 2009) but very rarely distinguish plantation politics as a separate aspect of global forest politics.



Critical political economy approaches can also be identified in plantation research. Especially the political ecology framework that identifies distribution problems and power relations and claims for normative judgments was applied in the study of tree-plantation conflicts (Gerber *et al.* 2009, Gerber 2010). The work of Rudel (2009) can serve as an interesting example of combining ecological economic inquiry with human ecology in the analysis of the social forces related to tree planting in the tropics. His quantitative study of cross-national plantation cases tests competing theories and looks for patterns and explanations of international tree planting activities.

The fundamental questions of the political economy of plantations are: who plants, what is being planted and on whose land? For whose benefit are plantations established? How is the benefit distributed? How do plantations affect stakeholders who are not directly involved in their functioning? How can and does the state regulate the socio-economic and environmental impact of plantations? What are the sources of knowledge that organize plantation practices, who defines their goals and how are they evaluated? The political ecological perspective requires asking: how does this human activity influence the environment – global, regional and local?

### **1.4.3 Theoretical approach in this study**

Political economic indicators important for studying plantations can be identified from the definitions and schools discussed in 1.4.1 and its application to the forestry research discussed in 1.4.2 and can be grouped in five general categories – or aspects. These are listed below and shown together with fundamental questions linked to them in Figure 1.1. The figure also demonstrates the conceptualization of the broader context in which the political economy of forest plantations is set – global economy and the international system (discussed in more depth in Chapter 3), as well as the link between the aspects of political economy of forest plantations and the concept of plantation paradigms (Chapter 4).

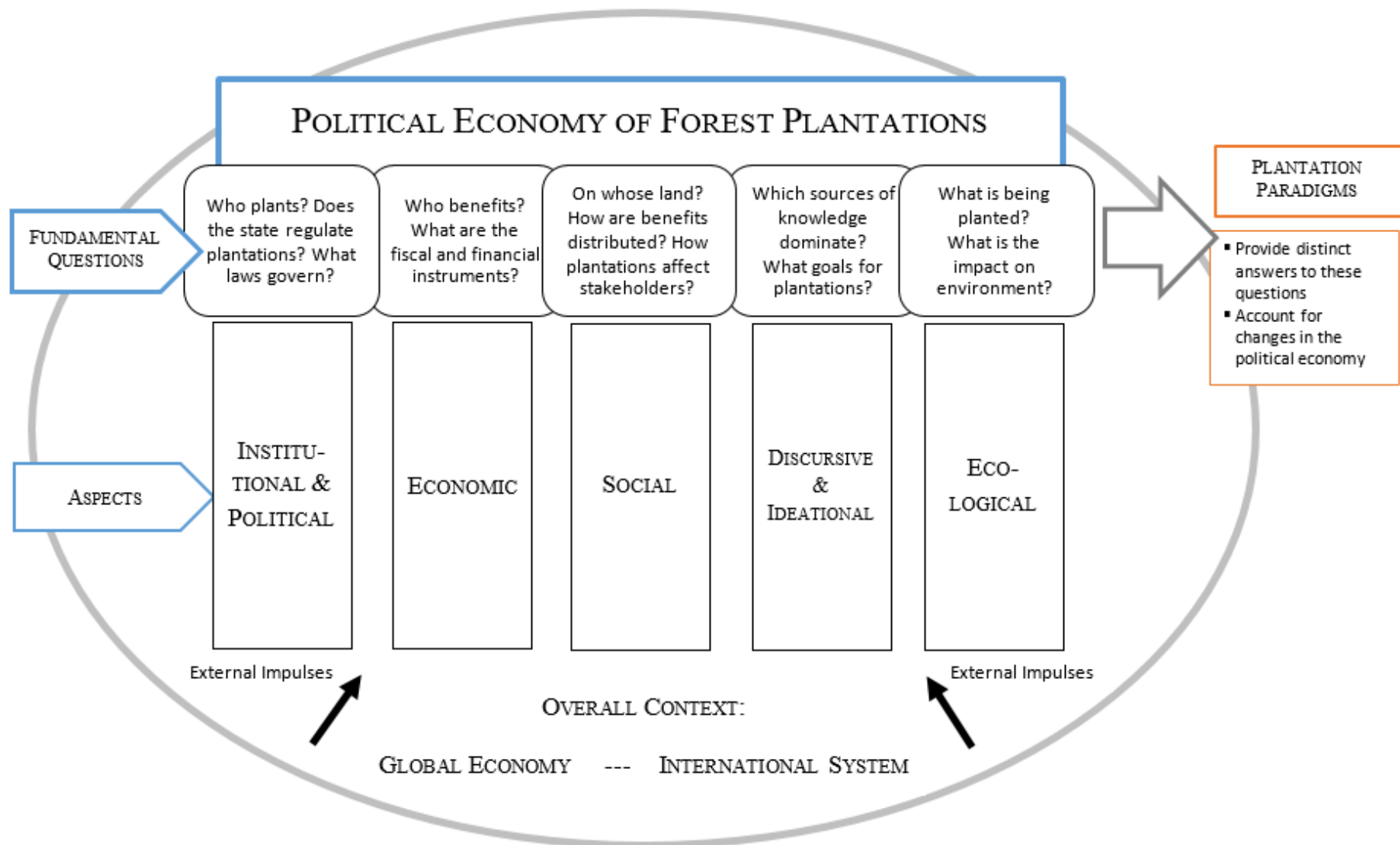
The crucial aspects can be categorized as follows:

1. Institutional and political aspects
  - a. (e.g. policies, laws, land tenure, role of government, influential actors etc.)
2. Economic aspects
  - a. (e.g. benefit sharing, impact on local and national economy, costs, taxes)
3. Social aspects
  - a. (e.g. participation, income distribution, provision of non-financial services)
4. Discursive and ideational aspects

- a. (e.g. knowledge structures, goal definition, plantation understandings, local knowledge)
- 5. Ecological aspects
  - a. (e.g. species planted, impact on biodiversity, water and other natural resource)

Based on the aspects of political economy derived from the literature review, a specific operationalization of criteria and indicators used in this study to delineate and then assess plantation paradigms will be provided in the next chapter.

This study tries to complement the existing economic analyses as well as the wide array of single case studies of plantations, by theorizing the link between global shifts and local practices. Set closer to the *sociological tradition* in political economy (Blyth 2010), it departs from an analysis of the global macro-economic context of development, and focuses on knowledge structures that organize plantation forestry. The study draws on *institutional economics* in the emphasis on the way local and national institutions regulate socio-economic conditions of plantations, and mediate the impact of global shifts. It uses concepts and tools of *policy analysis* to understand the way national legislation influences the plantation sector. In the analysis of global plantation paradigms and their local implementation, it borrows from *historical* and *post-structuralist International Political Economy* which “offers methods of analysis that seek, thoroughly and imaginatively, to question the ways in which knowledge and practice are historically conditioned and informed by patterns of power, values [and] interests in the global political economy” (Griffin 2011: 44). It is therefore related to the “socio-economics” in political economy. The study is both theory-driven and problem-driven. It is problem-driven as it tries to fill some gaps in the plantation research. Various sources point to the fact, that plantation politics, global trends, and also local socio-economic-ecological implications are under-researched and there is a strong need to fill this gap. As one researcher points out, “people have planted trees in rural places with increasing frequency during the past two decades, but the circumstances in which they plant and the social forces inducing them to plant remain unclear” (Rudel 2009: 545) and “for the past two decades studies of forest policy has been the ‘poor stepsister’ of research on land use and cover change in the tropics” (Rudel 2008: 253). As the authors of the last comprehensive publication on the political economy of tropical forest plantations note, “there has been little historical work examining the reasons for tree planting [...] Forestry decisions remain based on analyses of the present situation and forecasts of the future, in relative ignorance of the past” (Bass 1992: 41).



**Figure 1.1** - Political Economy of Forest Plantations: Aspects and Link to Paradigms (Source: own elaboration)

Why are plantations, despite their attractiveness in theory, still facing so many obstacles on the ground? The immediate answer seems to be, that there was so far not enough general reflection of the impacts of plantations in a broader sense, not enough knowledge and data to build theories and to support decisions. “Although planted forests are becoming increasingly important at global and regional levels and in the public and private sectors, performance in the past has not always been successful. Furthermore, there have been some instances of adverse environmental, social and economic effects from public and private planted forest programmes, often related to badly conceived policies, short-sighted planning or poor management practices. These have led to some negative perceptions of planted forests by some decision-makers and the general public” (FAO 2006: 41). What is more, “the impact (of shifting from natural forest to planted forests) on timber markets should be considered by policy-makers, planners and forest managers and supported by outlook studies that evaluate the future contribution of planted forests to economic, environmental and social services” (FAO FRA 2010: 87). Some planted forest investments have “created land-use, social and environmental conflicts, as well as suboptimal performance in the areas of health, vitality, productivity and return on investment” (FAO 2006: iii).

This study tries to fill some of the discussed research gaps. In an iterative process it tries to delimit, categorize and then apply forestry *paradigms* to the analysis of plantations. It puts emphasis on the socially and historically negotiated meanings of planted forests (Creswell 2009: 8-9). It bridges the macro and micro levels, applies theory-driven insights and looks for lessons to guide future plantation initiatives. On the level of philosophy of science, the study aims to propose an explanatory model in the post-positivist sense (Ibidem: 6-7), and close to Max Weber’s idea of the need for understanding (*Verstehen*), in which social phenomena are first interpreted (paradigms and their shift) and later, based on that, causal patterns can be traced (Bryman 2008: 15). The last part of critical assessment and lessons learned may additionally draw from advocacy, participatory (critical) and pragmatic philosophical standpoints (Creswell 2009: 9-11). On the ontological level, the analysis is open for both material and social factors, seeing the two as equally important for changes in global plantation patterns. In the study of global paradigms, the epistemological approach is predominantly interpretivist. However, as was already stated, interpretation is a foundation for explaining and problem-solving. The case studies combine the ideal-typical, Weberian approach with a positivist quantitative/qualitative methodology of Multi Criteria Analysis. The research questions are more problem-driven and not a priori attached to philosophical domains.

## 1.5 RESEARCH DESIGN

### 1.5.1 Theoretical Framework

The theoretical framework of this research bridges three levels: global, national and local thus enabling to study plantation policies and practices from different perspectives. Each level has different context and plantation drivers that can be identified and investigated. At the global level the research focuses on the macro-economic context, the role of plantation in the global political economy and a historical diagnosis through the study of the paradigmatic plantation development in time and space. It looks at specific aspects for paradigm delimitation that are presented in the graph with indicators of paradigms in plantations. The graph and indicators will be explained in detail in the methodological chapter in section 2.2. At the national level the research concentrates on two countries (Paraguay and Indonesia) with a much differentiated plantation history (Chapter 4.4). Finally at the local level the study looks at plantation case studies to look for the paradigmatic characteristics and assess their social, economic and environmental role (Chapter 5). Case studies, argues Campbell, are more suited to identifying how diffusing principles (such as paradigms) “are enacted—or translated into local practice—than most quantitative approaches”. By translation he means “the process by which exogenously given principles and practices, such as those diffusing from the transnational to the national level, are incorporated into endogenous or local ones” (Campbell 2010). What is additionally important is the feedback from the local level to the global level and the dynamics in the interaction of different levels.

This “feedback loop” is at the heart of the iterative process that constitutes this research. From global (macro) level economic (material) contexts and knowledge (ideational/social) structures, the delimitation of paradigms gives the researcher a tool with which to compare across levels. Inductively derived paradigm categories, are then applied to an analysis of the national (meso) and local (micro) level, where the same indicators are used, and hypotheses about the impacts of paradigms are tested. In a final move, the observations gathered in all the case studies are combined and assessed, to draw lessons for the future. The final learning component and function of the study are crucial. It begins with an empirical problem, proposes a theoretical typology, which is then applied to an empirical analysis. Its results are first contrasted with the theory and then used to draw lessons and concrete policy implications.

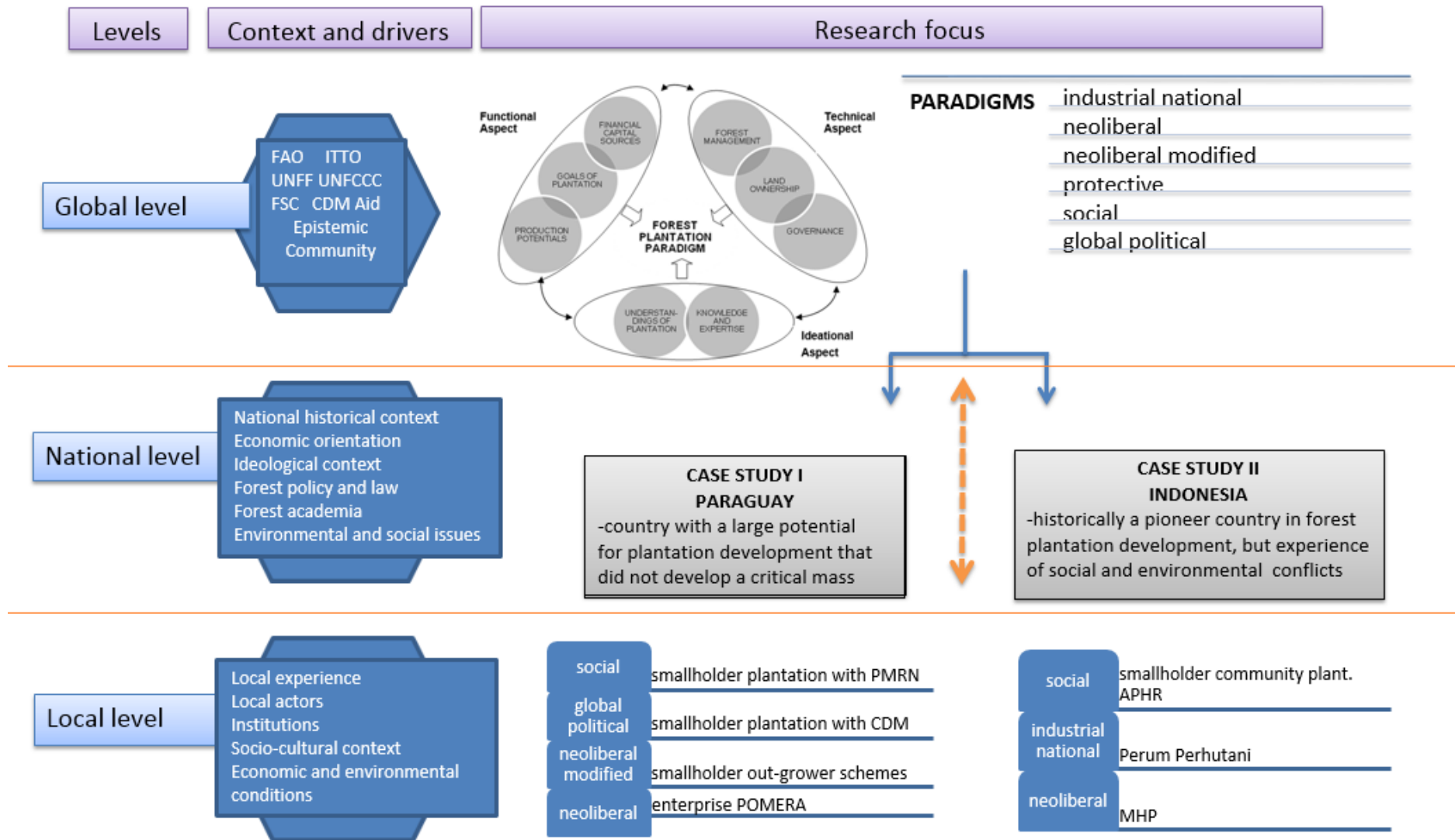


Figure 1.2 - Theoretical framework (Source: own elaboration)

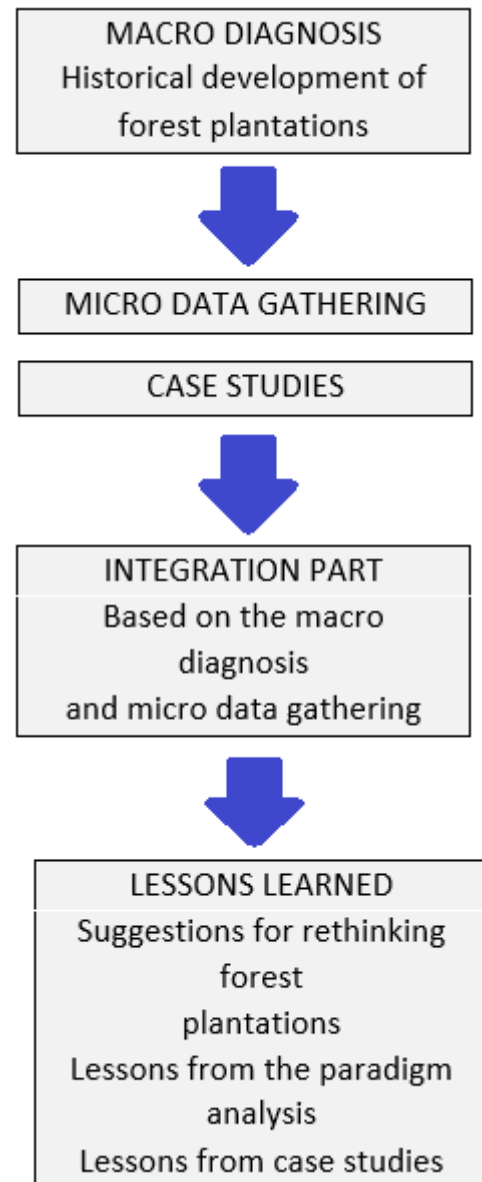
## 1.5.2 Goals and Objectives of the Study

In the light of the existing research gap with the changing conditions for plantations and the fact that the political and socio-economic problems related to tropical forest plantation efforts have not been sufficiently diagnosed and addressed, this work has the following *general objective*:

- To offer a theory-driven diagnosis to the historical development of plantations in the tropics with inputs from current plantation practices that helps to study, understand and learn from plantation development

From the general objective *specific objectives* follow and are related to the main research steps (Figure 1.3):

1. To understand the shift in the ‘paradigms’ of tropical forest plantations by providing the global economic context and a thorough historical analysis;
2. To provide an insight on the micro-level of forest plantation practices and socio-economic and environmental realities;
3. To link both these levels to provide theoretical insights on the organization of plantations;
4. To organize the findings under the learning model and produce a set of ‘lessons learned’ from the different paradigms and from the case studies;
5. To indicate further research gaps and the way how to proceed with studying the political economy of tropical forest plantations.



**Figure 1.3** – Overview of the research steps  
(Source: own elaboration)

The objectives listed here determine the *research questions* driving the study and the ‘steps’ with which it proceeded. In this work, the following *research questions* have been tackled:

- What were the global political and economic drivers of forest plantations development in the tropics? What can be the scale of plantation development in the next decades? (Chapter 3).
- How can the historical development of tropical forest plantations be categorized? (Chapter 4)
- What are the social, economic and environmental impacts of current plantation cases at the micro level and what are the differences? (Chapter 5)
- How well does the paradigm approach fit to analyze plantation case studies? (Chapter 6)
- What are the limitations of the paradigm approach (Chapter 7)
- How can the paradigm approach be used to learn and improve plantations and their actual role in bringing socio-economic and environmental benefits both for the local stakeholders and the investors as well as for the international community? (Chapter 8)



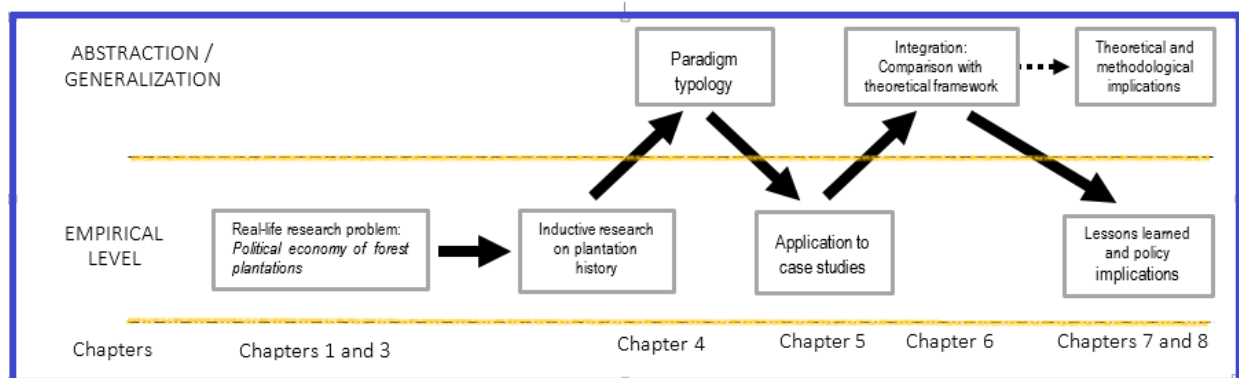
## Chapter 2 – Methodology

For better clarity and understanding of the methodological apparatus applied at different stages of the research, this chapter discusses the complete methodology of the study. At the beginning a short overview of the methodological approaches of different chapters is given (2.1). Later the subchapters discuss the detailed methodology for each research step (2.2 to 2.5). The remainder of this chapter deals with some ethical considerations linked to plantation research (2.6).

### 2.1 OVERVIEW OF THE METHODOLOGY AND DATA GATHERING TECHNIQUES

- Chapter 3 on the tropical forest plantations in the global economy builds on a *desktop analysis* of economic reports and secondary literature on the political economy of forestry and timber.
- Chapter 4 on the plantation paradigms and a global perspective on forest plantations builds on a *desktop* and *archival study* of existing literature on tropical forest plantations, supported by archival document analysis at FAO, study of the World Forestry Congress meetings and content analysis of the journal “Unasylva”. Recorded changes in the selected paradigm indicators, which correspond to the five major aspects of political economy discussed in the previous chapter, allow for an inductive categorization of plantation paradigms in an iterative process. The national level analysis of the paradigmatic development of the forest plantation sector in Paraguay and Indonesia was studied based on *primary and secondary data* from the selected countries and based on national level expert in-depth interviews conducted during the author’s fieldwork.
- The local case studies presented in Chapter 5 have been investigated during fieldwork. Data was collected locally for selected plantation cases with field surveys encompassing both qualitative and quantitative indicators. Also local and national expert interviews were conducted and local documents were gathered to crosscheck the information.

• The methodology used in Chapter 6 builds on the findings from the previous chapters. It finally links the macro and micro levels parts of the study, involves analysis of the selected case study sites against the developed set of questions related to the elements constituting a paradigm and critically assesses the paradigm assumptions against the field observations. It enables certain analytic generalizations and learning that are additionally discussed in Chapter 8 and 9.



**Figure 2.1** – Iterative research process in this study: Overview of steps and levels  
(Source: own elaboration)

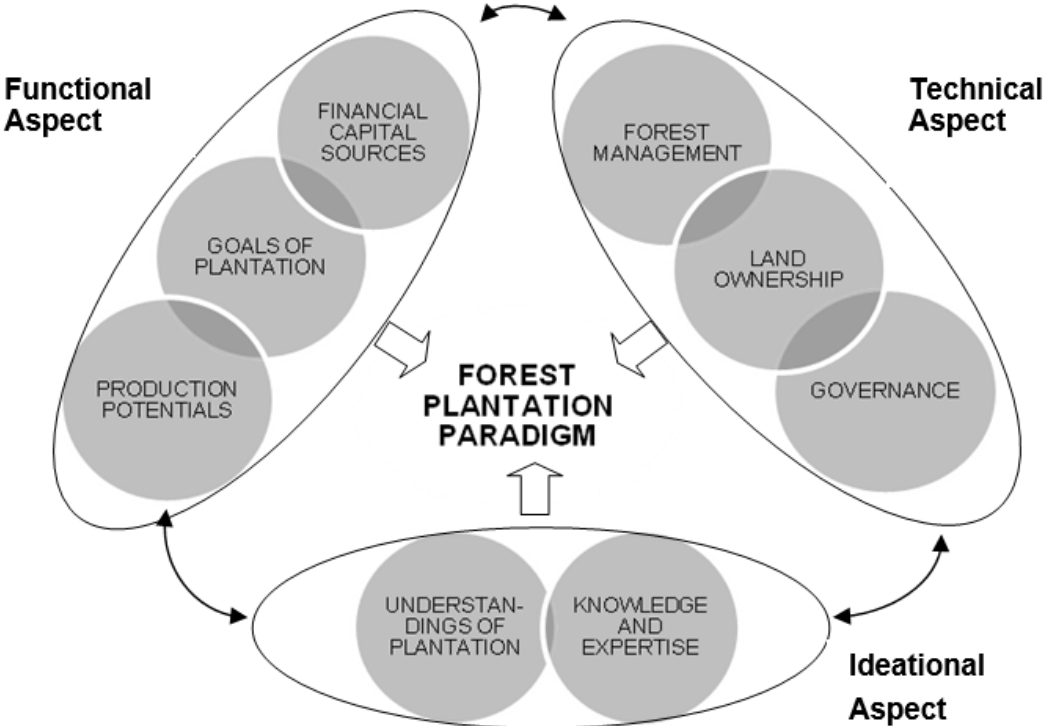
## 2.2 METHODOLOGY IN STUDYING PARADIGM CHANGE

Chapter 4 offers the analysis and categorization of plantation paradigms. The methods at this stage are mostly qualitative, involving the description, interpretation and categorization of forest plantation “paradigms”.

Paradigms in tropical plantation forestry were influenced by the shifts in the structure of the global political economy (material level) as well as the theoretical, scientific and ideological (ideational level) changes. For a better understanding of plantation politics and tracing of changes between the dominant approaches, this study proposes a set of key issues and specific indicators to study plantation paradigms. Based on these, a typology of ideal-type paradigms is put forth. The delimitation of paradigms is based on an iterative process and should be treated as a discussion contribution rather than any absolute judgment.

Investigation of plantation paradigms is based on the indicators identified in the political economy framework and applied to the specific character of tree planting. Such core indicators that were identified as subjected to change (see: Figure 2.2) can be divided into technical aspects

(vary from land ownership modes, forest management and governance issues), ideational aspects (understanding of plantation, knowledge and expertise centres) and functional aspects (goals for planting, investment source, production potential). Planting activity, which was expected to be a rather technical skill, has always been highly subjected to changes in ideas related in turn to broader historical and economic developments (the context includes political, environmental and socio-economic background and policies for plantation investment, depends on markets, livelihood strategies, other land use types, etc.). The changes in paradigms result in what is being planted, where, on what scale, on whose land, what kind of actors are involved, what kind of incentives used, who can produce expert judgments and how it is justified.



**Figure 2.2** - Indicators Constituting a Paradigm in Plantation Research (Source: Szulecka *et al.* 2014)

To analyse the evolution of paradigms in tropical plantation forestry, several qualitative methods were employed. The background for the historical analysis is the study of important policy milestones, which significantly altered the international approach to planted forests (see: Chapter 3). This was followed by research at the FAO archives, plantation expert interviews, a discourse and content analysis of the FAO archival documents and World Forestry Congresses’ outputs as well as a content analysis of the journal “Unasylva”, central to the field (see: Annex to Chapter 4). In the analysis, changes in paradigm indicators were recorded and grouped to allow for identification of specific paradigms and their sub-variations.

Textual analysis methods are useful to engage in the “characteristics of manifest language and word use, description of topics in texts, through consistency and connection of words to theme analysis of content and the establishment of central terms” (Neuendorf 2002: 5). While discourse analysis in its proper sense requires the scholar to deeply engage with meaning of concepts and their relation to socio-political structures, content analysis remains at a more technical level of definitions and word associations, and is therefore better fit for the preliminary analysis of the apparent ‘paradigm shift’ in plantation forestry.

Content analysis in particular is the envisaged method to classify textual material and to reduce it to more relevant, manageable sets of data, which can be organized and analyzed, and finally – allow to produce valid inferences from the texts (Weber 1990). It is applied to the text samples of the journal *Unasylva*, in an attempt to capture the discursive changes related to plantations.

The empirical material to study paradigm change has been selected to represent the most diversified international forum of what can be termed an “epistemic community”<sup>3</sup> of plantation forestry – the World Forestry Congress (WFC). Because the historical timeline plays a crucial role in the research, the analysis takes into account the WFC meetings from 1926 until the present day. Another analysis was conducted on the community’s top journal. At regular intervals of twenty years, the renowned International Journal of Forestry and Forest Industries *Unasylva*, established under the UN Food and Agriculture Organization (FAO) in 1947 is reviewed. Four issues underwent detailed analysis (1947, 1967, 1987 and 2007) where all occurrences of the words *plantation/-s*, *planting* were coded and a specific context of each word has been analyzed. This is seen as an indicator of the attitudes towards plantations, their definition and associated notions.

In the Annex to Chapter 4, the World Forestry Congress and *Unasylva* analysis are presented in detail. Focus of the analysis is on the paradigm indicators shown in Figure 2.2. For both sources a synthetic table is presented with crucial changes in the paradigm indicators. The initial categorization was based on inductive research and improved in the iterative process. It was presented for feedback and constantly improved after discussions in the Institute of

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<sup>3</sup> An “epistemic community” is defined by Peter Haas, the proponent of the concept, as „a network of professionals with recognised expertise and competence in a particular domain and an authoritative claim to policy relevant knowledge within that domain or issue-area” (Haas 1992: 3). Furthermore, its members “hold a common set of causal beliefs and share notions of validity based on internally defined criteria for evaluation, common policy projects, and shared normative commitments” (Ibidem).

International Forestry and Forest Products at the Dresden University of Technology in Germany, at the Department of Land, Environment, Agriculture and Forestry of the University of Padova, at the 6th European Consortium for Political Research General Conference at the University of Iceland, at the Tropentag 2011 at the University of Bonn and at the annual conference of the Forest and Nature for Society (FONASO) consortium in Göttingen in 2012. Finally it underwent a triple blind review process as part of the article published by the International Forestry Review.

The national level analysis of the paradigmatic development of the forest plantation sector in Paraguay and Indonesia was studied based on *primary and secondary data* from the selected countries and based on national level expert in-depth interviews conducted during the author's fieldwork and stay in Paraguay (2011/2012) at the Universidad Nacional de Asunción (UNA) and in Indonesia (2012) at the Center for International Forestry Research (CIFOR). It provides a paradigm-driven diagnosis of the plantation sector development in both countries.

## **2.3 METHODOLOGY APPLIED IN CASE STUDIES**

### **2.3.1 Case selection**

Methodology applied for the study of local level impacts of various plantations (Chapter 5) builds on primary and secondary data gathered from seven plantation case studies during fieldwork conducted in 2011 and 2012. Due to the *how* and *why* questions posed in the study, no possibility to control the events which are complex social phenomena in a real-life context and work with multiple sources of evidence, an explanatory and exploratory case-study type (Yin 2003) has been applied. The research design builds on a *comparative multiple case-study with embedded units of analysis* (Yin 2003) where case studies are selected from two countries (Paraguay and Indonesia) with a highly different approach to plantations. Paraguay on the one hand is representative as a country with a large potential for plantations that did not develop a critical mass of plantation estates. Indonesia has been selected as a historically pioneering country in plantation efforts, which experienced typical plantation related conflicts (both socio-economic and environmental). The embedded units of analysis are composed of Paraguayan

and Indonesian plantations case studies selected with a working hypothesis to reflect the global paradigms from the macro level analysis from Chapter 4.

Paraguay and Indonesia, although very different in total population and population density are comparable in terms of GDP per capita, significant population growth rate, a significant proportion of rural population and official unemployment rate. Paraguay possesses three times as much population under the poverty line compared to Indonesia (Table 2.1).

<b>Country Comparison</b>	<b>Paraguay</b>	<b>Indonesia</b>
Total population (July 2014 est.) (millions)	6.7	253.6
GDP per capita (2012) (USD)	3,813.47	3,556.79
Annual population growth rate (2008-2013) (%)	1.73	1.3
Rural population (2013) (% of total population)	37.00	47.75
Unemployment rate (2013 est.)	6.6%	6.6%
Population below poverty line	34.7% (2010 est.)	11.7% (2012 est.)
Total land area (1000 hectares)	39,730	181,157
Population density (2012) (inhab/km <sup>2</sup> )	16.43	128.5
Total forest area (2005) (1000 hectares)	18,475	88,495
Productive plantation (2005) (1000 hectares)	43	3,399
% of plantation in respect to total forest area	0,23%	3,84%

**Table 2.1** – Paraguay and Indonesia in comparison  
(Source: FAO STAT 2014 and CIA World Factbook 2014)

In each country a set of typical plantation types has been chosen to reflect particular plantation paradigms identified in the historical analysis. As both countries vary considerably in terms of national context and forest policies, not all paradigms could be identified in Paraguay and Indonesia simultaneously. As table 2.2 below shows, the social paradigm in plantations was easily found in both countries and exemplary plantations have been selected. Also the neoliberal paradigm with private companies responsible for the entire plantation management was identified in Paraguay and Indonesia (although this paradigm is more visible in Indonesia where corporate ownership dominates the plantation landscape). Regarding the industrial national paradigm it could only be identified in Indonesia, where the state-owned company still manages vast plantation estates. No state-led planting examples could be identified in Paraguay where the policy was to subsidize tree-planting organized by third parties rather than develop state owned commercial plantations. The global political paradigm that is strong at the global discursive level is very poorly represented in terms of real plantations worldwide. This is the reason why only one plantation from Paraguay could be selected for analysis. There was no advanced CDM plantation in Indonesia that could be identified at the time of this research and a range of REDD pilot projects in that country did not organize typical plantation estates. Lastly, the neoliberal modified paradigm in form of outgrower schemes was only selected in Paraguay.

In theory, similar arrangements in Indonesia also exist. However national expert interviews revealed, that such partnerships are only instrumental (companies lend land from smallholders but don't involve them in any plantation-related activities) and therefore such arrangements should not be classified as the typical neoliberal modified paradigm where real duty and power sharing exists.

Case study	Paraguay				Indonesia		
	Smallholder plantation PMRN	Smallholder plantation CDM	Out-grower schemes	Enterprise POMERA	community plantation APHR	State enterprise Perum Perhutani	Enterprise MHP
Paradigm	Social	Global political	Neoliberal modified	Neoliberal/Neoliberal-modified	Social	Industrial national	Neoliberal/Neoliberal modified

**Table 2.2** - Plantation case studies assigned to the historical plantation paradigms (Source: own elaboration)

As Maps 2.1 and 2.2 show, plantation cases in Paraguay are located in the Eastern region of the country, where most of the Paraguayan population lives and where all of the significant plantation initiatives take place. In Indonesia two plantations are located on the island of Java and one on the Sumatra Island. This is also typical geographical representation of planting activities in the country, where plantations historically started on Java and later moved predominantly to several provinces on Sumatra (where corporate plantations are dominant due to relative land availability).



**Maps 2.1 and 2.2** – Location of plantation case studies

	Paraguay				Indonesia		
	Smallholder plantation PMRN	Smallholder plantation CDM	Out-grower schemes	Enterprise POMERA	Community plantation APHR	State enterprise Perum Perhutani	Enterprise MHP
District	San Pedro	Paraguari	Itapua	Alto Parana	Regency: Wonosobo District: Leksono Central Java	Regency: Blora District: Randublatung Central Java	Regency: Muara Enim District: Rambang Dangku South Sumatra
Communities	Cuatro Vientos, Choré /15 Agosto	Acahay/Yukyty; Roque/Arasaty	Hohenau	Hernandarias	Kalimendong	Tanggal	Subanjeriji
Plantation start	2003	2007	2000	1996	1970s	1930s (by the Dutch)	1996
Species	<i>Eucalyptus grandis</i> , <i>Eucalyptus camaldulensis</i> , <i>Melia azedarach</i> (Paraiso), <i>Tabebuia impetiginosa</i> (Lapacho), <i>Cedrela</i> (Cedro) and other natives	<i>Eucalyptus grandis</i> , <i>Eucalyptus camaldulensis</i> , <i>Grevillea robusta</i>	<i>Eucalyptus grandis</i> , <i>Eucalyptus camaldulensis</i> , clones, (also Pine plantations in the area but not within the project)	<i>Eucalyptus grandis</i> , <i>E. grandis x urophylla</i> Own clones	<i>Albizia falcataria</i> , <i>Paraserianthes falcataria</i> (Sengon)	<i>Tectona grandis</i>	<i>Acacia mangium</i>
Total plantation	2'000ha	215,2 ha, estimation after losses: 140ha	3'000ha	7'000 ha	427 ha	Perum Perhutani 1'750'860 ha Management unit: 2'850 ha	193'500ha
Sizes of smallholder	0.25-3ha / household	0,5-2ha / household	0,75- 250ha / household	-	0,01-2,5ha/ household	-	-
Production potential	MAI 20 m <sup>3</sup> /ha/year (rotation 7-12 years)	MAI Eucalyptus up to 20 m <sup>3</sup> /ha/year Grevillea up to 10 m <sup>3</sup> /ha/year MAI (rotation Eucalyptus: 12 years, Grevillea: 20 Years)	MAI for fuelwood 30 m <sup>3</sup> /ha/year (rotation 7 years)	MAI 40 m <sup>3</sup> /ha/year (rotation 12-14 years)	MAI 20-25 m <sup>3</sup> /ha/year (rotation depends on the farmers 3-15 years)	MAI 4-8 m <sup>3</sup> /ha/year (for long 70 years rotations and is expected to double with Perhutani superior teak)	MAI depends on site: high: 25-30 m <sup>3</sup> /ha/year, medium: 20-25, low: 15-20 (rotation 6 years)
Products	Fuelwood, timber, own use	Fuelwood, timber, own use	Fuelwood, timber	Plywood and sawtimber (52%), fuelwood (44%), posts (2%), woodchips (2%)	Timber for construction purposes at the local and national markets	Timber for processing – e.g. furniture For exportation	Pulp exported for paper production in Japan

**Table 2.3** - Plantation case-studies in comparison.  
(Source: Own elaboration, data collected by the author)



Plantation case studies significantly differ in terms of the basic characteristics. The oldest visited plantation was initiated in the 1930s and the most recent in 2007.<sup>4</sup> Total plantation area ranges from around 200 hectares in one Paraguayan case to almost 200 000 hectares as in the case of one Indonesian plantation. Species selected for planting were different with Eucalyptus dominating in Paraguayan plantation estates and Teak with Acacia being the most significant plantation trees in Indonesia. Plantations of native species in smallholder estates are also represented in the case studies. Production potential strongly differs and depends on planted species, available technology and scale. The final products of various plantations are much diversified, from fodder, fuel wood, construction, to industrial round wood, pulp or carbon emission reduction.

### **2.3.2 Data gathering for the comparative multiple case-study and MCA**

Data for the case studies was gathered during fieldwork in both countries in 2011 and 2012 through personal interviews with plantation stakeholders - farmers, plantation employees, plantation executives, local plantation experts (see: table 2.4 Primary data collection at the local plantation level) and national experts<sup>5</sup> (forestry authorities, academics and activists, see: table 2.5 Primary data collection: national level). Interview partners were selected to represent a broad spectrum of interests and knowledge regarding plantations. Primary data was accompanied by documentation analysis, third-party reports and direct observation. Following data sources have been used and are presented in the Annex to Chapter 5:

- Stakeholder questionnaire on socio-economic-environmental performance;
- Stakeholder questionnaire on paradigm change;
- Local plantation expert interview;
- National level expert in-depth interview;
- Secondary data

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<sup>4</sup> Plantations younger than that were not considered as potential case studies due to their limited impacts and experience.

<sup>5</sup> Some of the national experts were identified as well-known plantation specialists in their countries, some were identified through the key institutions related to forest plantations.

Data collection: local level	Paraguay				Indonesia			TOTAL
	Smallholder Plantation with PMRN	Smallholder Plantation with CDM	Small- holder out-grower schemes	Enterprise POMERA	Smallholder Community plantation APHR	State enterprise Perum Perhutani	Enterprise MHP	
Representativeness <sup>6</sup>	For the area (20%)	For the case (10%)	For the case (10%)	Sample of stakeholders	For the case (10%)	Sample of stakeholders	Sample of stakeholders	
Stakeholder questionnaire on paradigm change	28	15	15	10	34	22	9	133
Stakeholder questionnaire on socio-economic- environmental performance	28	15	15	10	34	22	9	133
Local plantation expert in-depth interview	3	1	1	3	3	2	2	15
Direct observation and plantation visit	<input checked="" type="checkbox"/>							
Local documentation	<input checked="" type="checkbox"/>							

**Table 2.4** - Primary data collection at the local plantation level (Source: Own elaboration)

The method used to evaluate the selected plantation case studies against the chosen criteria and indicators is Multi-Criteria Analysis (DETR 2009, Mendoza and Prabhu 2000, Mendoza and Macoun 1999). MCA allows to work with mixed data (socio-economic, biophysical, and discursive) and to accommodate multiple criteria in the analysis and does not cause limits on the form of criteria. It allows for the incorporation of both qualitative and quantitative information and to handle them simultaneously (Mendoza and Macoun 1999: 22). Finally the results of MCA can be presented on radar diagrams (Chapter 5.3) and allow for a good comparison between both countries and between the different plantation paradigms. Steps for the MCA and the dataset used in the analysis are discussed and listed in the Annex to Chapter 5. Data for analysis are provided on a CD attached to the monograph.

For the evaluation of selected plantation case-studies against social, economic and environmental criteria one shorter questionnaire for stakeholders and one in-depth semi-structured interview questionnaire for experts have been developed.

The criteria and indicators were divided into three domains of social, economic and ecological sustainability. Social aspects concentrate on the plantation's relation to social wellbeing, its relation to social norms and ethical values. Economic aspects deal with the costs and benefits related to

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<sup>6</sup> For small and medium smallholder plantations representativeness amounts 10% of the participants in the project. In case of a big project (as PMRN) involving thousands of participants an area has been selected, where 20% of the participants have been interviewed. For the companies the respondents have been selected to reflect diversified positions offered by the company from different levels.

plantations, and capital handed from one generation to the next. Lastly the environmental aspects look at plantations through the prism of ecosystem viability and functionality (Tropenbos 1996:18).

Data collection: national level expert in-depth interviews <sup>7</sup>	Paraguay	Indonesia	TOTAL
University	2	2	4
International research centre		3	3
National Forestry Institute	4	1	5
Enterprises and investment sector	4	3	7
NGOs	3	2	5
Development assistance	1	1	2
Forest engineers working with plantations	2	2	4
Consultants:	2	2	4
Conferences:	Second National Forestry Seminar Asuncion, 5-6.03.12	Workshop on governmental loan program for smallholder plantations Wonosobo, 28.06.2012	
<b>Total:</b>	<b>18</b>	<b>16</b>	<b>34</b>

**Table 2.5** - Primary data collection: national level (Source: Own elaboration)

### 2.3.3 Questionnaire design

The questionnaires have been created taking into account globally recognized standards for both sustainable forest management and specific plantation management. The departure point are fundamental international plantation guidelines, namely FAO Guidelines for the sustainable management and use of planted forests (FAO 2006) and ITTO guidelines for the establishment and sustainable management of planted tropical forests (ITTO 1993).

However, the guidelines have been used as a reference point for the main issues that should be assessed in a socio-economic and environmental analysis of plantations. Particular indicators have been selected with help of other elaborated standards coming from the academia, certification, and reference standards elaborated by international organizations and research institutes. Such sources of indicators were the reference standard proposed for principles, criteria and indicators for plantation evaluation elaborated by Masiero (2010), the hierarchical framework for the formulation of sustainable forest management standards (Tropenbos 1996), revised ITTO criteria and indicators for the sustainable management of tropical forests (2005), ITTO tropical forest tenure assessment (2011), CIFOR principles, criteria and indicators for SFM (from: Mendoza and Prabhu 2000), ILO criteria for SFM (from: Poschen 2000) and ISEAL code of good practice for assessing the impacts of social and environmental standards systems (ISEAL 2010). Selected indicators are listed in the tables on the indicators for paradigm analysis and criteria (table 2.6) and indicators for Multi-Criteria Analysis (table 2.7) presented

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<sup>7</sup> For the confidentiality of the expert interview partners the particular institutions are not listed in the table. The interviewees have been selected to represent diversified institutions with reference to plantations (academic, business, national administration and NGOs).

below (see also: Annex to Chapter 5). They are linked to the technical, ideational and functional aspects used as paradigm indicators and already discussed in the Figure 2.2.

Paradigm Aspects	Paradigm Indicators	Explanation	Field Indicators	Type of information in the indicators
<b>Technical (HOW?)</b>	Land ownership	How is access regulated? What is the plantation land status? (i.e. private/public, exclusive/inclusive etc.)	Land title Land size Land conflict  Additional land use	Formal land title Land size in hectares Presence of land-related conflicts Other land use patterns at the plantation site (agroforestry/silvopasture)
	Plantation management authorities	How is the plantation managed? Who is responsible? (Centralized, community-based etc.)	Responsibility for decision making	Person or institution responsible for plantation-related decisions
	Governance	How is the plantation governed? (top-down, bottom-up, vertical etc.)	Participation	Participation score based on two proxies decision-making + membership Decision making: owner with advise or owner= 2; owner with obligations = 1; company = 1 + membership: 0 = no participation; 1 = minimal; 2 = small; 3 = visible, 4 = large
<b>Ideational (WHAT?)</b>	Understandings of plantations	What are plantations and how are they justified? (Progress, profit, equitable growth etc.)	Perception  Local benefits  National benefits  Global benefits	Perception assessed by the interviewee: positive, neutral, negative Local benefits: Income, environmental services, saving, employment, construction, value added, fuelwood, multiple answers possible. National benefits: national market supply, export, environmental services, national science, no benefits, multiple answers possible. Global benefits: preventing global warming, oxygen, carbon trading, global timber supply, generally good for global environment, no benefits, multiple answers possible.
	Knowledge and expertise	What is the source of authority? (Local knowledge, Western scientific discourse, political framing etc.)	Source of expert knowledge  Familiarity with national forestry agencies Cooperation with national universities  Cooperation with international universities	Source of expert knowledge: 1 - local knowledge, 2 -cooperative, association, 3-external project, 4-national institutions, 5-company 6-books Familiarity with national forestry agencies: Yes(specify)/No Cooperation with national universities: Yes(specify)/No Cooperation with international universities: Yes(specify)/No
<b>Functional (WHY?)</b>	Goals of plantations	Why are we planting? What is the long-term purpose? (wood production, environmental services, carbon sequestration etc.)	Product	Fuelwood, timber, plywood, sawtimber, posts, woodchips, pulp, own use.
	Financial capital source	Why the actors invest? Who provides capital and expects to benefit? (State, private, community, NGO etc.)	State support External support	Yes(specify)/No Yes(specify)/No
	Production potentials	Differences in growth rates under different paradigms ( $m^3 ha^{-1} year^{-1}$ )	MAI Perception of production potential	MAI range in $m^3 ha^{-1} year^{-1}$ Small/medium/large

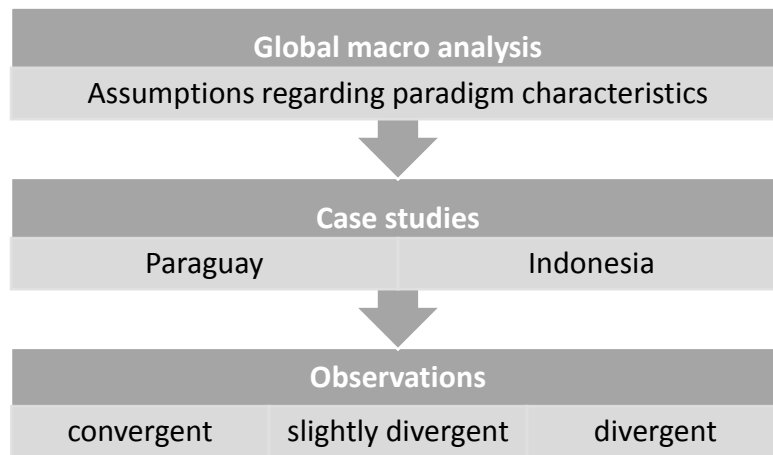
**Table 2.6** - Indicators for paradigm analysis. \* Instruments for data collection at this stage come from three sources: stakeholder questionnaire on paradigm change, local plantation expert interview and secondary sources (Source: Own elaboration)

	Criteria	Indicators	Type of information in the indicators
<b>SOCIAL</b>	Local participation	S1 membership in local organizations	0 = no; 1 = limited; 2 = active
		S2 Access to Training programmes	Yes/No
	Work safety	S3 Access to protective clothing and equipment	Yes/No
		S4 Accidents on plantation sites	Yes (knows accidents)/ knows minor incidents/No
	Access to provisioning services	S5 Access to education	1-access to primary education, 2-access to secondary education, 3-access to university
		S6 Access to health care	Yes/limited extent/No
		S7 Access to clear water	Yes/No
		S8 Food security	Yes (1-farm diversification 2-local market), limited, no
		S9 Housing	Yes (brick/wood/adobe), No
	Local involvement in decision making and respect for traditional values	S10 Consultation in land use planning	Yes/No
		S 11 Respect for traditional land use	Yes (for what practices)/No
	Migration	S12 In-migration of plantation workers	Strong/Limited/No
		S13 Out-migration of local population	Strong/Limited/No
	Information access	S14 Access to information considering plantation	Good (where?) / Limited/ No
	Conflict resolution	S15 Mechanisms for conflict resolution	Yes (weak/advanced) /No
	Child labor	S16 Minimum employment age	Yes/No
	Discrimination	S17 Preference based on race, social origin, gender, political opinion	Yes(specify)/No
<b>ECONOMIC</b>	Benefit sharing	Ec1 Plantation income and coverage of the basic needs	0-small 1-significant 2-high
		Ec2 People working on the plantation (owner, family, employees)	Jobs per hectare O-owner F-family E-employees, multiple answers possible
		Ec3 Day salary for plantation work in USD (1USD=4500Guarani, 1USD=1000Rp)	Value (range or fixed)
		Ec4 Value added chains	Yes/No/Considered in the future
	Market access	Ec5 Target markets	l-local r-regional n-national e-export o-own use ns-not specified
		Ec6 Expectation of problems with selling the products	Yes (pp- problem with price, ps- problem with selling), no
		Ec7 Prices for wood	USD/m <sup>3</sup>
	Environment for investments	Ec8 Corruption and thefts	No/sporadic/common thefts
		Ec9 Plantations linked with the future of the local children	yes, conditionally yes but not work personally, no
	Capital	Ec10 Investment cost in plantation/ha	USD/ha
		Ec11 IRR	% estimated by local experts
		Ec12 MAI	m <sup>3</sup> ha <sup>-1</sup> year <sup>-1</sup>
		Ec13 Competition	Low/High
		Ec14 Access to loans	Yes/No
		Ec15 Existence of perverse incentives, competing land uses	Yes, No, specify competing land use
<b>ENVIRONMENTAL</b>	Land use change	En1 Land use before plantation	A-agriculture Pa-pasture D-degraded land F-forest Pl-plantation
	Water impacts	En2 Impact on water quantity	Positive/neutral/negative/unsure
		En3 Impact on water quality	Positive/neutral/negative/unsure
	Use of species	En4 Use of exotic species	Yes/No
		En5 Use of native species	Yes/No
		En6 Use of clones	Yes/No
	Habitat function	En7 Occurrence of local animals	Decrease/stable/increase (most frequent answer)
	Relation to natural forest	En8 Influence of plantations on natural forest logging	d-decreases pressure, nr -no relation
	Threats	En9 Pests	No, Rare, Frequent, Very Frequent
		En10 Fires	No, Rare, Frequent, Very Frequent
	Soil	En11 Restrictions on machinery	Yes/No
		En12 Roads designed to minimize erosion	Poorly/Well designed and managed
	Chemicals	En13 Use and disposal of chemical substances	Restrictions yes/no special disposal yes/no
	Certification	En14 Is the plantation certified?	Yes (by whom?)/No
		En15 Is certification in the future considered?	Yes/No/Why?

**Table 2.7** - Criteria and indicators for Multi-Criteria Analysis. \* Instruments for data collection at this stage come from the following sources: stakeholder questionnaire on paradigm change, local plantation expert interview and secondary sources: stakeholder questionnaire on socio-economic-environmental performance, local plantation expert in-depth interview and secondary data (Source: Own elaboration)

## 2.4 METHODOLOGICAL ISSUES IN INTEGRATING THE LEVELS

The final research step culminates the iterative and explorative process that has guided the research so far. Paradigms are identified as global discursive constructs in an inductive reading of archival sources. These are then used as ideal types in organizing data acquired in case studies. In Chapter 6, the paradigms are assessed against the indicators that allowed their initial delimitation. The initial assumptions derived from the macro analysis are contrasted with the field observations (see: Figure 2.3 below, a detailed comparative analysis is provided in Annex to Chapter 6). This is done in a discursive way but supported with a correlation analysis between the paradigms and their indicators (results of the correlation analysis are also presented in Annex to Chapter 6). Correlation analysis was carried out between the indicators and paradigms using the SPSS software.



**Figure 2.3** – Integration and dynamics between the levels of analysis (Source: Own elaboration)

## 2.5 METHODOLOGY FOR ALTERNATIVE EXPLANATIONS TO THE PARADIGM CONCEPT

One of the problems with interpretive methodologies is that the actual results measured using qualitative and quantitative methods on the ground could have other causal factors than those proposed. To account for this possibility, Chapter 7 was dedicated to alternative explanations and two statistical tests were conducted using the data acquired in the Multi Criteria Analysis (MCA). The *group average link analysis* shows the degree of similarity between the units of analysis taking into account all indicators from the MCA. On the other hand, the *principal component analysis*, shows determining indicators and the distribution of cases in a two-

dimensional figure. The purpose of this additional analysis was to discover similarities and difference between plantations that cannot be accounted for by the paradigm concept.

All the research steps presented in this study can be replicated and there is a CD with collected field data, with the normalization process and presenting the calculations for the development of final radar diagrams. Additionally it encompasses the correlation analysis between paradigms and data from the case studies for selected indicators.

## **2.6 RESEARCH ETHICS**

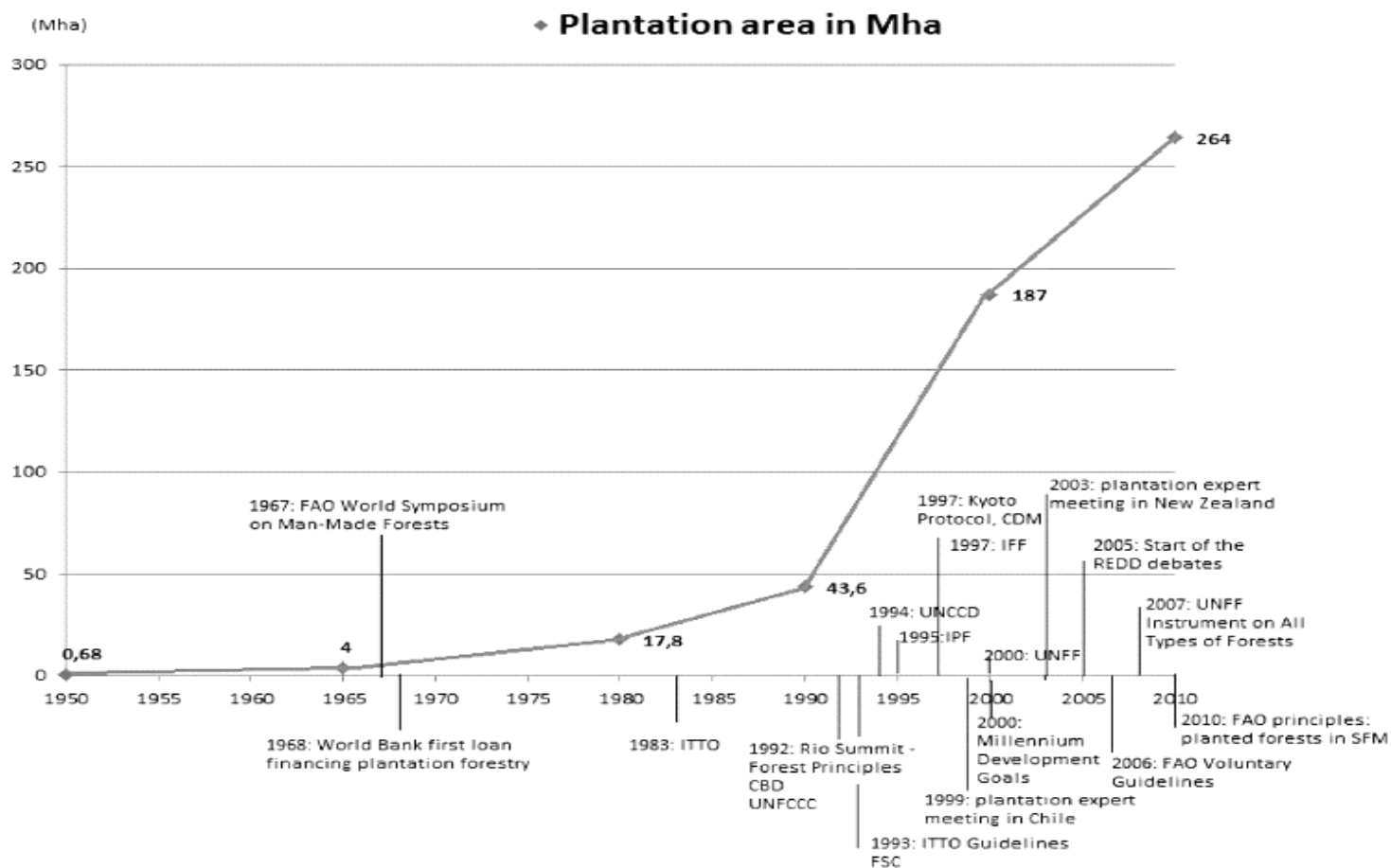
Ethical considerations were taken during the research design and implementation. The study did not directly interfere with the livelihoods of local populations. All interlocutors were informed about the scientific character of the research and the confidentiality of the data. Reasons for coming to the areas were clearly explained, times and locations were chosen to be convenient for the interview partners. All the quotations of the interviewee's are marked with numbers and don't reveal interlocutors' names and affiliations.

In a broader sense other ethical considerations may be identified in this work. Political economy of tropical forest plantations constitutes an ethical problem in itself, related to the inequalities between the global North and South, and their relationship. The research touches the legitimacy of existing governance arrangements both on international and national levels, responsibility for both the welfare of populations and the environment (cf. Gritten *et al.* 2009).

## **Chapter 3 – Tropical Forest Plantations and the Global Economy: From Timber Trade to Carbon Offsetting**

This chapter looks at tropical forest plantations from a political economy perspective. Its main aim is to provide the global economic context for the following analysis of the paradigms in plantation forestry, thus painting a fuller picture of the changing political economy of forest plantations. Besides economic drivers of plantations, it looks at the institutional and political aspects, social issues, discursive and ideational aspects and ecological factors (indicators in the political economy school identified in 1.4.3). It gives a brief discussion on the rapid evolution and expansion of tropical plantation forestry in the 20<sup>th</sup> and early 21<sup>st</sup> century, emphasizing the changing macro-scale political and economic patterns (subchapters 3.1 to 3.4). It traces these global shifts along the most important policy milestones which influenced plantation forestry and formed the by now complex international regime. The chapter constitutes a background for the analysis of forest plantation paradigms that follows and subchapter 3.5 provides a direct transition from the political economy to plantation paradigms. After a brief introduction, the sequence of the chapter is chronological and concentrates on the global evolution of the plantation sector. It is divided into three stages from 1950s to 1970s, from 1970s until 1990s and after 1990. These timeframes were selected as reference points due to the changing pace in global plantation development in that period. In the first phase, the global plantation area increased slowly by about 4 million hectares in the 20-year period. In the second period a fast pace of plantation development may be noted, with over 40 million hectares of added plantations while in the third phase a plantation boom saw more than 200 million illustrated the new trend. The three different periods are well visualized on the changing plantation area in Figure 3.1. They are also relevant from the political economic perspective with significant market changes and plantation characteristics occurring in the discussed periods. The logic of presentation in this chapter is historical but other categorizations of plantations' development might be interesting to study the political economy of forest plantations, as the analysis according to the dominant planted species. Such complementary investigation with a typological order of plantation developments according to the planted species can be found in the Annex to this Chapter.





**Figure 3.1** - Changing plantation area with the most influential milestones of global forest plantation politics (Szulecka *et al.* 2013).<sup>8</sup> The figure is not to suggest a causal relationship between the policy milestones and the increase in plantation volume, but rather the continuous and simultaneous growth of plantations and the recent increase of the complexity of the regime that tries to regulate it (Source: Own elaboration).

<sup>8</sup> As already noted in Chapter 1, many differences in the data on plantation scale exist and they may be caused by the vague distinction between planted forest and semi-natural forest and adopted definition of plantation forest itself. Due to the historical scope of this analysis and bearing in mind the changing definitions of forest plantations and planted forests in the last decades (FAO FRA 2000, FAO FRA 2005), in this work, as stated in 1.2 in the discussion of forest plantation definitions, a very inclusive definition of plantations as *forest stands raised artificially* is applied (Zhang and Owiredu 2007). Also moderate numbers are preferred, e.g. FAO FRA 2010 provides lower and more realistic figures than FAO 2005 due to some important revisions in earlier estimates.

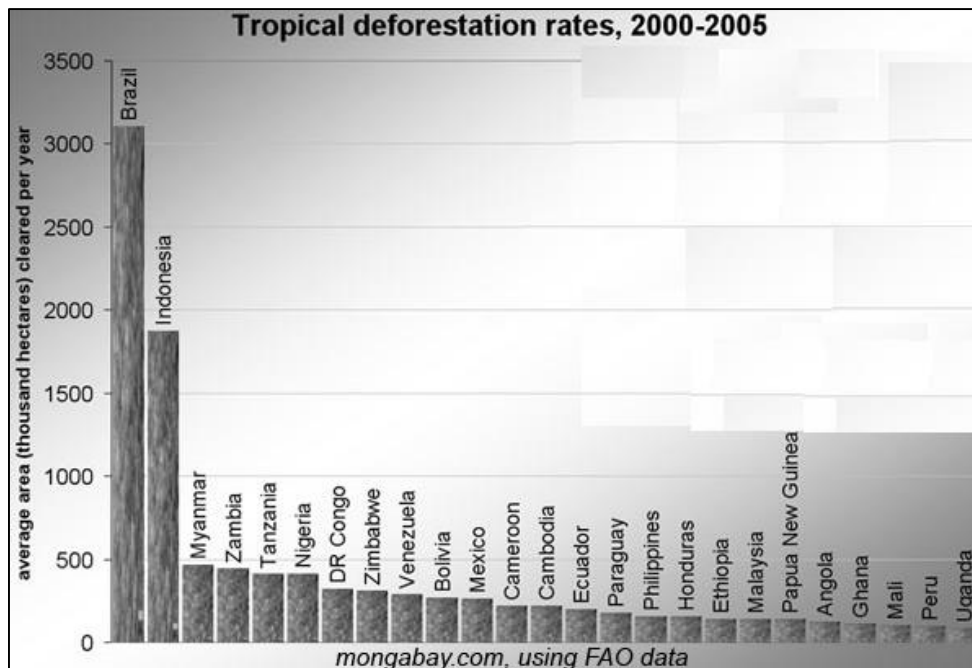
### 3.1 RAW MATERIAL FOR INTERNATIONAL MARKETS

#### *1950s – 1970s*

Forest plantations in the tropics are, from the perspective of international political economy, a subset of the global forestry sector that bears some specific characteristics. Firstly, due to the geographic focus on the tropics and subtropics, discussions of plantation forestry are necessarily intertwined with the problem of deforestation. Secondly, tropical countries remain, by and large, in the category of developing and least-developed states. Their changing political and economic interactions with the developed North, and the rest of the developing South, are therefore also an important reference point.

Plantation forestry has always been triggered by prior deforestation and the incentives to plant became strong only when the limits of natural forests grew nearer, and as the supply of cheap wood from forests was less stable. For this reason there was relatively little global plantation activity prior to World War Two, under the colonial rule. Expansion of plantation volume (see Figure 3.1) coincides with decolonization and a wider shift in global timber trade. Overall trade volumes “remained modest right up until the end of World War Two”, with an average annual volume exported lower than five million cubic meters in roundwood equivalent (Gale 1998: 62). As timber export became better organized, the post-war growth in trade volume was extraordinary. Between 1950 and 1960 the volume of cumulated natural forest and plantation exported logs grew five-fold, of sawn wood – three-fold, and of veneer and plywood – ten-fold. These volumes tripled again by 1970 (Ibidem).

As natural forest was cut, the more trees were planted, but the figures do not match – deforestation rates are significantly higher than reforestation and afforestation (Figure 3.2). Nevertheless, it is clear that the rapid increase in plantation efforts continues from 1950s and according to the FAO scenarios the general trend will remain in the next decades (Carle and Holmgren 2008). Most of the tropical plantations consist of four species: *Eucalyptus* (24%), *Pinus* (18%), *Tectona* (17%) and *Acacia* (9%) (ITTO 2009: 13). A detailed analysis of dominant plantation species is provided in the Annex to this chapter.



**Figure 3.2** - Deforestation rate in tropical countries (Source: Mongbay.com)

In 2010 planted forests constituted about 7 percent of the global forest area and occupied about 264 million hectares (FAO 2010a). The most rapid increase in plantations globally can be observed from the 1990s, so are the new global initiatives and policy milestones that shape international plantation discourse.

In 2007, global roundwood production was at 3.6 billion cubic meters. Over a half (52%) is harvested for fuelwood, the remainder for industrial roundwood. 30% of these are pulplogs used for the production of pulp for paper and paperboard, 61% are sawlogs – for sawnwood and panels (FAO STAT in: Dauvergne and Lister 2011: 56). Plantation wood’s share in the tropical forest industry is most significant in pulp production (over 95%) and in the reconstituted wood panels (85%) (ACPWP 2007: 10). The proportion of plantation wood in plywood and sawnwood industry is significantly lower but according to all predictions will be growing fast in the next decades.

Historically, global forest plantation policy is traceable from the second half of the 20<sup>th</sup> century when important policy milestones need to be emphasized and key international actors identified (Cadman 2011). Before analyzing the changing plantation discourse it is necessary to look at the emerging international recognition for plantations in a historical perspective.

In spite of a long tradition of human tree-planting activities over centuries, as Sargent and Bass note “almost all of the major plantations were established after 1950” (1992: 61). The total plantation area in 1950 constituted 0.68 million hectares and was dominated by Indonesian teak (Lanly quoted in: Evans and Turnbull 2009: 28). The first milestone in the global plantation arrangements was the *FAO World Symposium on Man-Made Forests and their Industrial Importance* held in 1967 in Canberra, Australia. It “established a global recognition of the potential importance of planted forests” (Carle and Holmgren 2008).

It is important to note the role that tropical forest plantations played in the global economy of that time. Logs and other types of primary products were a commodity that originated in the newly independent developing countries, but were processed – and gained added value – elsewhere, usually in the industrial plants and pulp mills of the developed states. As a simple resource, plantation products (and timber in general) created limited benefits for the developing societies, while much of the profit was collected by the processing entities. Furthermore, centralized, often authoritarian governments of newly independent states usually had full control over the countries’ resource base, granting concessions or steering resource export (Bryant 1996). Prone to corruption and rent-seeking, tropical timber prices suffered from “resource booms” (Ross 2001). Price decrease during the booms, significant capital input for plantations establishment and long investment horizon were all hindering factors for plantation investments. Compared to concessions granted in natural forests “viewed as tree mines containing 'green gold' ready for exploitation” (Gale 1998: 73), the interest in plantation investments was low.

The next policy milestone, which marked the beginning of financing plantations by international agencies, is highly significant for plantation forestry. Due to their expertise in forestry and investments, FAO, WB and ITTO are international key-actors in plantation politics until now<sup>9</sup>.

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<sup>9</sup> Since then most investment in forest plantation development, note Evans and Turnbull, has been “in the form of low interest loans from international or regional development banks” (2009: 72). At first hardly significant, by the 1990s these investments reached very considerable proportions. Between 1992 and 1999 the World Bank had projects worth \$3.5 billion in its portfolio, and the International Financing Corporation (IFC), a member of the World Bank group, a further \$578 million invested in pulp and paper industries. The FAO Investment Center assisted developing countries with \$850 million between 1991 and 1995 (Ibidem). China alone received World Bank funding to plant over 1 million ha of forest plantations across the country (Evans and Turnbull 2009: 80). The purpose of their activity in tropical plantation forestry was to expand the possible export revenues for developing states and to combat deforestation. However, in the global economy’s division of labor of the 1960s and 1970s (Levine 1995), their role was still envisaged to be the same as in the colonial period – suppliers of raw material needed for processing and consumption elsewhere (although domestic consumption is increasing).

In 1968 the World Bank has credited the first loan for a plantation in Zambia (Evans and Turnbull 2009: 30). The loan of \$5.3 million (from a total cost estimated at \$11 million) was granted to the Government of Zambia for the initial eight years of its afforestation programme aiming at establishing some 16 000 hectares of pine plantations (Unasyuva 1968). This plantation lead to diversification of Zambia's production and was designed to bring foreign exchange savings and to push wood related industries. But the World Bank was promoting a universal development model that emphasized large scale forest plantations in a top-down planning procedure. This, together with poor technology adaptation and lack of local understanding, lead to many plantation failures that resulted in international debts of some tropical countries (Pretzsch 2014: 25).

### **3.2 ADDING VALUE DOMESTICALLY: SHIFT IN THE ROLE AND SCALE OF TROPICAL PLANTATIONS *1970s – 1990s***

An important shift was the expansion of fast growing species which in the tropics allowed the production of soft-wood on rotations 2-5 times shorter than in the dominant softwood producing boreal and temperate countries. In late 1960s, fast-growing Eucalyptus plantations in Brazil gained an incredible momentum. Eucalyptus, notes Smouts, grows “twice as fast in Brazil than a comparable species in Spain and five times faster than in Scandinavia” (2003: 118). The military government then in power aimed at establishing a large wood pulp export industry. New necessary legal and institutional conditions were established, policies promoted tree planting by a new forestry code and fiscal incentives favoring large-scale capital and offered special tax-breaks for importing pulping machinery (Carrere and Lohmann 1996: 148). Three types of fiscal incentives for establishing planted forests have been introduced (1) privately owned planted forests were not taxed, (2) income originating from plantations was not taxed, and (3) funds used for afforestation or reforestation were deductible from the income tax of individuals and companies (BFIN 2011). Similar economic and fiscal incentives would later be introduced in other dominant plantation countries.

Another crucial step in the global plantation arrangements in the 1980s was achieved in 1985 with the Tropical Forestry Action Plan (TFAP), a joint initiative of FAO, the UNDP, the World Bank, and the World Resources Institute. TFAP promotes donor coordination at the

international level, development of specific National Forestry Action Plans and has been very active in promoting expansion of plantation areas (WRI 2011). But the program did not fulfill its objectives. With a top-down approach and leaning to big companies while overlooking local populations, it brought many adverse effects. In terms of plantations it promoted only single-species, single-commodity production plantations, especially of Eucalyptus for pulp.

The next significant step in the expansion of the plantation forestry regime is related to international negotiations which led to the subsequent International Tropical Timber Agreements (1983, 1994, 2006), responsible for governing the International Tropical Timber Organization's (ITTO) work. Among the different forms of ITTO's visible output are four sets of non-binding guidelines. One document is solely dedicated to plantations (ITTO Guidelines for the Establishment and Sustainable Management of Planted Tropical Forests) (compare: Chaytor 2001: 16-21). Timber, however, was not the main driver of plantation forestry. Tropical countries accounted for only 20% of the world's timber production at the turn of the century, and of this only some 20% reaches the international market and only a portion comes from forest plantations (Smouts 2003: 111). ITTO's Guidelines for 'best practice' for planted tropical forests are the first comprehensive document devoted to tropical forest plantations with a clearly universal outlook. They have been produced in collaboration with representatives from tropical timber producer and consumer countries, NGOs (WWF), UN Agencies (FAO) and trade sector (UCBT) (ITTO 1993). They are not a manual for silvicultural treatments on plantations, rather a "summary of the major issues and principles that need to be addressed in the planning, establishment and management of planted forests in tropical environments" (Ibidem).

At that time, large timber producing nations were already visibly consolidated – both politically and economically. Understanding that they only serve as sources of raw material and they give away much potential profit, countries like Brazil, Malaysia and Indonesia gradually introduced bans on log exports. A large number of timber producing countries formally banned the export of logs from their territory. Brazil introduced such legislation in the late 1970s, Indonesia moved from initial restrictions in 1980 to a complete ban in 1985 (Smouts 2003: 109).<sup>10</sup> These restrictive policies had common goals – to expand domestic processing industries, halt deforestation, and

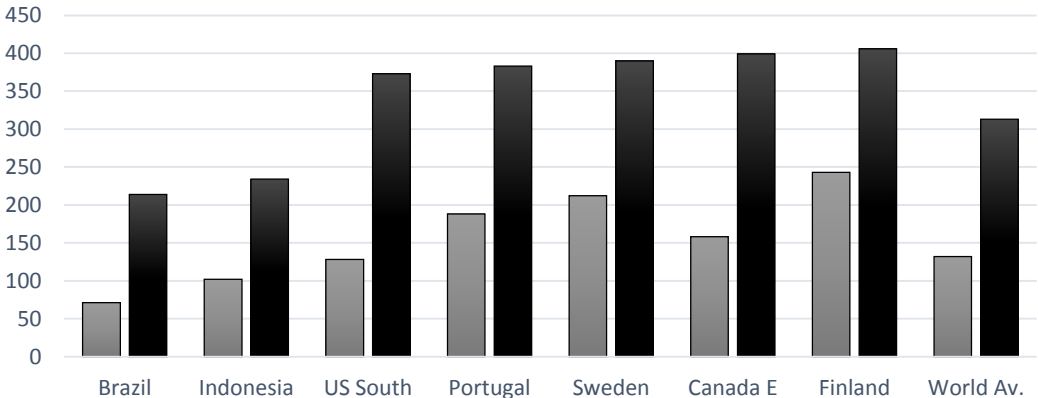
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<sup>10</sup> "Under pressure from the International Monetary Fund, this ban was lifted at some point in 1998. The following year, no log exports were officially recorded. All the 1999 exports were illicit, done with illegally harvested timber. In 2000, the Indonesian government decided to reinstate the log export ban as a means to help control this illicit traffic" (Ibidem).

bring foreign investments in the timber producing countries – in wood processing but also in plantations assuring stable resource supplies. The results were, however, not always as planned. Without an appropriate fiscal policy and effective monitoring of plantation and processing, banning raw timber exports often “has the effect of sheltering local inefficient and unproductive sawmills and processing plants from international competition and world prices. This can only increase the waste of wood resources and over-exploitation of the natural forests, while depriving the state of substantial revenues” (Smouts 2003: 110).

Tropical developing countries are able to produce wood products – most notably pulp – at much lower prices, gaining a comparative advantage over developed nations (Figure 3.3). This advantage results from many factors, including lower wages, but as the Figure 3.3 also shows, costs of wood remain lower in tropical countries, and transportation costs are reduced due to the location of mills close to sources of wood (i.e. plantations).<sup>11</sup> The first attempt to change this arrangement moving a step up in the value-added ladder, came from Brazil, which already in the late 1970s began to expand not only its plantation potential but also domestic pulp and paper industry. Similar moves were made by other large producers – Indonesia, Malaysia, Chile, Argentina, Thailand, Cambodia, Ivory Coast and others, and the 1980s also saw the expansion of timber processing capacities with new sawmills built.

### Wood Costs and Hardwood Pulp Costs



**Figure 3.3** - Costs of wood (left) and costs for Bleached hardwood pulp (right), 2004, USD/t, total delivered cif (costs, insurance, and freight) to West Europe (Source: Own elaboration based on Nordic Energy Perspectives 2009).

<sup>11</sup> This factor, together with a ban on exports, had a most significant impact on the position of Japan in the global paper market. Without any productive forests or plantations of its own, Japan relied on raw material imports, which became more difficult to acquire. In the recent decades it also has to cope with South East Asian competition in production and the growing Chinese demand.

While pulp is a highly volatile commodity,<sup>12</sup> low-cost producers are more resilient to recurring price drops. This means that there is a good business case for plantations of fast growing species to supply wood pulp. The scale of this global sector, which contributes \$1 trillion to the world economy of ca. \$60 trillion – is considerable (Dauvergne and Lister 2011: 55). As a result of the expansion of Brazil's, Indonesia's, Malaysia's, Chile's and other tropical countries pulp production capacity, combined with a steadily rising demand, world shipments of market pulp increased by 43% from 1990 to 2000 (Milstein *et al.* 2003). In the same period and to a great extent – as a result – plantation area witnessed its greatest historic leap: from an estimated 43 million hectares to some 187 million hectares (Figure 3.1). This is not to say, however, that plantation efforts have followed at a similar pace as enhanced processing capacities – in the case of both timber and pulp. The development of production capacities was far swifter than that of the plantations, and the latter only supplied a minute portion of the wood used (8% in Indonesia in 2000 while the rest came from natural forest, to large extent from undocumented sources) (Smouts 2003: 119). The proportion of plantation wood in Indonesia is increasing and ambitious government targets planned to base pulp mills only on plantations, but the regulations needed to be postponed several times (ITTO 2009: 53). Until this day, much of the necessary wood is acquired from natural forests, often illegally.

Illegal logging is an important problem and a disturbance to the economic calculation behind forest plantations (Obidzinski *et al.* 2007). Firstly, from the perspective of the state, it brings significant losses. The cost for developing countries is estimated at \$10 billion per year, plus an additional \$5 billion lost in unpaid taxes (Dauvergne and Lister 2011: 50). Secondly, for plantation investors, illegally logged timber constitutes dangerous competition as it can be sold at below market prices and thus can have indirect negative impact on the plantation profitability.

With plantation volume, employment in the sector grows as well. At the end of the 1990s it was estimated that the number of full-time jobs in industrial forestry in the developing countries is about 2.7 million (Poschen 1997 in: Evans and Turnbull 2009: 86). In 2005, both developed and developing countries reported some 10 million of workers employed in forestry (FAO FRA 2005). Plantation forestry is, however, not labor intensive. It is estimated that 3.8 workers per hectare are employed during tree planting, but the figure falls sharply after the first year of plantation duration (Ibidem). Only on marginal lands, plantations can be more labor intensive than agriculture, bringing between

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<sup>12</sup> To illustrate just how volatile it can be: the price of benchmark Northern bleached softwood kraft (NBSK) went from \$390/t in 1993 to \$975/t in 1995, and fell back to ca. \$560/t by the end of 1996 (Pineault 2006: 20).



70 man-days per hectare (for afforestation of grasslands) to 400 man-days per hectare (for work on steep terrain). Plantation management after that will provide only about 9 to 15 man-days per hectare annually (Morrison and Bass 1992: 101). The more machines are implemented in plantation work, the smaller employment input becomes. Brazilian labor demand for plantation maintenance can be as low as 0.005 person per hectare (Tomaselli 2009: 34).

<b>Labor demand in forest plantation, Brazil</b>	
<b>Investment phase</b>	<b>Labor demand (<i>person/ha</i>)</b>
Planting	0.025–0.132
First year (maintenance)	0.010–0.047
Second year (maintenance)	0.005–0.040
Following years	0.010–0.015

**Table 3.1** - Labor demand in Brazilian forest plantations (Source: Tomaselli 2009)

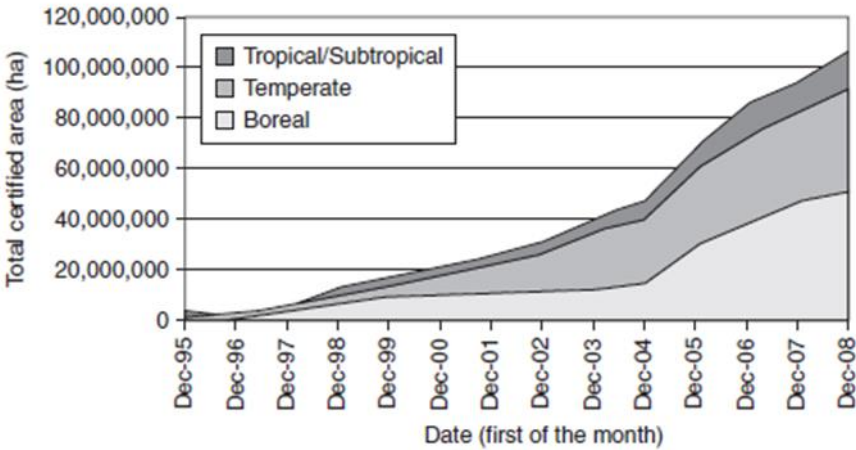
### **3.3 FROM RIO UNTIL THE PRESENT: CERTIFICATION AND CARBON FORESTRY? *1990s - ONWARDS***

The 1992 United Nations Conference on Environment and Development in Rio de Janeiro, also known as the Earth Summit or the Rio Summit, was a groundbreaking event in relation to global environmental and development politics, including the future role played by forest plantations. The Summit resulted in some prominent documents such as the Convention on Biological Diversity, Framework Convention on Climate Change, Rio Declaration on Environment and Development, the “Agenda 21”, and a document related solely to the global forestry issues called Forest Principles, a set of voluntary recommendations regarding forestry. The principles clearly refer to plantations, afforestation and reforestation as important tools in forestry’s future.

In the 1990s, a large increase of the number of initiatives concentrating or touching plantation issues can be observed. 1993 brought the significant reference point of the ITTO Guidelines. Tropical forest resources were “mined for their timber and then abandoned or put to more productive uses as forest plantations or for cultivation” (Gale 1998: 206). Under the provision of the by now mature international regime, forests are scarce resources and much more attention is put on plantations that require 'management' if they are to “continue to yield tropical timber in perpetuity” (Ibidem). The international timber regime emphasizes the role of governments

in regulating forestry practices and plantation management, setting the level of the annual cut, and protecting watershed and biodiversity functions.

1993 also brought an important governance shift – the Forest Stewardship Council (FSC), an independent, not for-profit non-governmental organization aiming to promote responsible forest management worldwide. As the evolution of the forest regime reached a deadlock, parallel to the state-led institutional process, non-state forest certification schemes started to emerge (Gulbrandsen 2004: 76). “Some of the most extensive and innovative experiments in ‘new’ governance”, writes Cadman, can be found in the forestry sector and forest management certifications is one of them” (2011: 25). FSC became the first NGO to elaborate and implement third party certification schemes, its Code of Ethics and Code of Conduct set ethical principles to guide decision making and specify compliance rules for certified members. FSC stresses transparent, independent and participatory standard setting. It developed a unique participatory process balancing the three constituent chambers: social, economic and environmental, all additionally divided into North and South sub-chambers (Tollefson *et al.* 2008). FSC generic principles and criteria are translated into national and regional standards in a further participatory process and there are guarantees to effectively involve the indigenous populations.



**Figure 3.4** - FSC-certified forest area between 1995 and 2008 – by region. (Source: FSC General Assembly [2008] in: Gale and Haward [2011])

FSC principles and criteria apply both to the natural forests and plantations, with a specific Principle 10 dedicated to plantations (Masiero 2010: 115). Today about 10% of FSC certified areas are plantations (FSC 2011). As Figure 3.4 shows, the area of FSC-certified forests and plantations in the tropical countries is growing relatively slowly compared to boreal forests. However, in the context of the developing countries almost half of the total area certified by

FSC is made up of plantations (Gulbrandsen 2004: 90). FSC initially showed a great potential to fill the gaps in the ineffective global forest regime. However, currently industry-driven competing schemes, less rigorous than FSC, emerged in many regions and started to take over the FSC targets, often watering down their normative prescriptions for plantation governance (Ibidem: 86-9, Pattberg 2005). The second largest certification scheme – Programme for the Endorsement of Forest Certification (PEFC) was established in 1999 and also developed specific plantation standards. It is mostly popular in Canada, United States and in Europe but there are three other countries, such as Brazil (1.17 million hectares mainly through Cerflor), Chile (1.95 million hectares mainly certified through Certfor) and Malaysia (predominantly natural forests certified through MTCS) where the scheme is significantly applied (PEFC 2014). The program is not a single standard and shows visible shortcomings in the developing world (Gulbrandsen 2008). It is notable that PEFC and other certification schemes automatically recognize FSC certification, but this is not mutual. That is why the emergence of FSC norms is very significant for the governance of tropical plantation forestry.

The next milestones regarding global forest and plantation arrangements in the form of the Intergovernmental Panel on Forests (IPF), the Intergovernmental Forum on Forests (IFF), and finally in the United Nations Forum on Forests (UNFF) can be also traced back and explained in relation to the Rio Summit and fragmentation of the plantation discourse. IPF/IFF/UNFF process can be seen as a core forest-related standpoint adopting the most traditional resource-oriented view on the forests' role. The IFF and UNFF did not achieve much in global plantation governance, two international expert meetings dedicated to plantations in Chile in 1999 (IFF 1999) and in New Zealand in 2003 (UNFF 2003) can be portrayed as its main output in this domain. UNFF remains a loose forum that is ineffective in practice (Chaytor 2001). Gale's analysis of the timber trade regime raises the powerful argument that "those who benefit from the current normative structure governing tropical rainforests formed a blocking coalition to prevent the regime's necessary restructuring" (1998: 3).

Apart from the timber-oriented regime, other policy areas had an impact on the governance of tropical forest plantations and their role in the global economy. Most notable impulses came from the sustainable development agenda. Forestry in general, but also plantations are recognized as a valuable land use tool to achieve what was codified in the Millennium Development Goals, a declaration signed in 2000 to improve social, economic and environmental conditions of the world's poor. Plantations are related primarily to Goal 1

(eradicate extreme poverty and hunger), Goal 7 (ensure environmental sustainability) and goal 8 (develop a global partnership for development). Proportion of land area covered by forest is a direct indicator for the monitoring process (MDG 2011).

However, plantations are not welcome uncritically. Many NGOs warned for decades of the rapid expansion of monoculture forest plantations. A range of possible negative environmental and social impacts of large-scale uniform plantations is extensively documented in the literature and NGO reports (Greenpeace 1994, Gerber 2010, Nuñez Mutter and Overbeek 2011). Plantations may be a major direct cause of the destruction of native forests, grasslands, wetlands and thus cause irreversible biodiversity loss. Another potential threat is the impact on water tables. Due to chemical use, they may cause contamination and deterioration of soils and watersheds. Plantation companies may violate land rights of local people, lead to social conflict, limit local food diversification, hinder land reforms, cause unemployment, migration etc. Brazilian Eucalypt plantations provide up to 245 times less employment per hectare than small scale agriculture (Global Forest Coalition 2014).

What is clearly visible is the increase of complexity regarding the role prescribed to forest plantations, as their area increases. This can be illustrated by a recent significant global arrangement towards plantations: FAO's "Responsible management of planted forests: Voluntary guidelines" from 2006, known also as the Planted Forests Code. The two-year preparation process involved a range of actors, including national governments, private sector (both corporate and smallholder), academia and NGOs (FAO 2006). Plantations' perception in the document is very complex, touching different horizontal (balance of social, cultural, environmental and economic dimensions of planted forests; acknowledging the role of policy, planning, decision-making, implementation and monitoring) and vertical issues (linking international, national, and local levels). FAO's *Planted Forest Code* is clearly less prescriptive compared to FSC rules and its aim is more to define the role of the government and other stakeholders, while FSC is more meant to define the responsibilities of plantation managers (van Bodegom *et al.*: 17).

The last set of policy developments which have an impact on plantation governance – much less their current political economy – is the climate regime. Large developing nations ruling over the remaining rainforests have since its inception pushed for the inclusion of forests as 'carbon sinks'. Under the Kyoto Protocol and the following summits of the United Nations Convention on Climate Change (UNFCCC) this was, however, ruled out. Under the Clean

Development Mechanism forestry projects were confined to afforestation and reforestation (AR) activities – plantation forestry. Due to the complex procedure and lack of full political agreement, “only one forestry project had gained the approval of the CDM Executive Board as of February 2008, versus more than 900 registered projects overall” (Ebeling 2008: 43-44). Three years later, Chokkalingam and Vanniarachchy (2011) report 22 registered Clean Development Mechanisms (CDM) afforestation and reforestation projects worldwide from more than 3000 CDM projects in total.

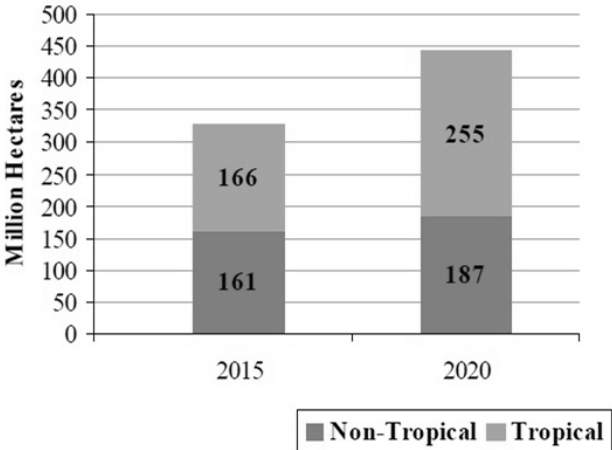
These so called ‘carbon forestry’ projects were “debated extensively because of concerns about their real contribution to climate change mitigation and their possible negative effects on host countries’ sustainable development” (Locatelli *et al.* 2008: 107). NGOs warn that climate policy may provide additional incentives for deforesting natural forests and replacing them with monoculture plantations (for timber/pulp and carbon credits) while studies have shown that old stand forests are much better carbon sinks than planted forests (Luyssaert *et al.* 2008, Gorte 2009). Despite the still small scale of this sub-sector, a new element of plantations’ political economy appeared with the concept of ‘carbon credits’ granted for afforestation and reforestation projects that proved their ‘additionality’. Concerns for the overall global carbon market are in the nature of carbon forestry projects. While forest plantations have a high mitigation potential, a “flood of cheap carbon credits from this source” could significantly undervalue the price of carbon credits (Ebeling 2008: 46). On the other hand, the climate change discourse and the incentives of the climate policy regime can change cost-benefit calculations for different types of plantations. Not only large-scale, monoculture plantations developed for mitigation purposes, but also smallholder, social plantations as means of climate change adaptation can benefit from this political debate. Especially the debate of REDD mechanisms has shed new light on environmental services and social benefits of natural forests (and growingly also – plantations).

### **3.4 NECESSARY EXPANSION OF PLANTATIONS, UNCERTAIN IMPACTS**

While the political economy of tropical forest plantations has evolved over time and is undergoing important changes today, it is clear that both economic and environmental incentives for tree planting are very strong. Mather argued already in the late 1990s that “the trend is clear: the plantation area is expanding and increasing proportions of industrial wood are coming from planted forests” and it will get even stronger when effective conservation of

the remaining natural forests enters into force (1997: 11). Estimates and scenarios predict a further rapid plantation increase, with most expansions taking place in tropical countries and areas of the southern hemisphere (see: Figure 3.5). Regardless of the exact overall pace of plantation development and its geographical distribution, most of the future wood supply will come from plantations and a rapid expansion will take place in the tropics and subtropics.

Unlike in the first decades of their expansion, plantations now have a strongly South-South dimension. That is: Asian plantation products are mostly exported to other Asian countries, while only Africa still produces mostly for European markets. Four tropical countries: Indonesia, Brazil, Malaysia, and India, were at the turn of the century both the largest consumers and the largest producers of tropical logs and sawn wood. In both cases, one exporter, Malaysia, and two importers, Japan and China, handle most of the international trade (Smouts 2003: 112). Indonesia and Malaysia, together exported more than 80% of all tropical timber traded at the end of the 20<sup>th</sup> century (Gale 1998: 63).

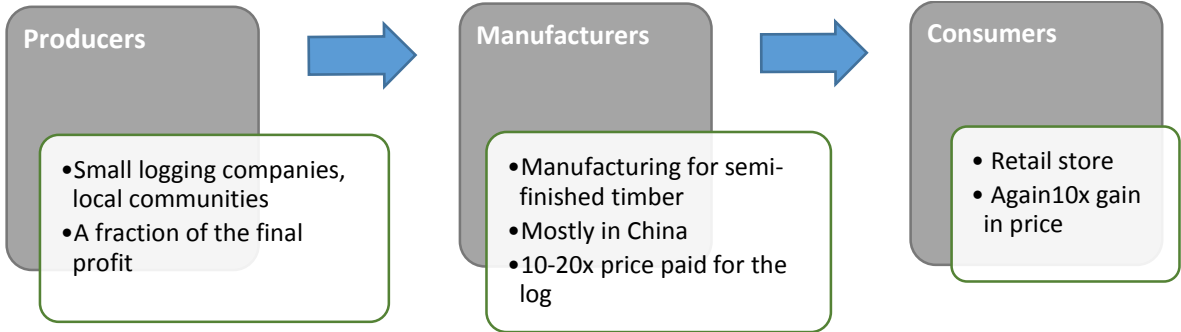


**Figure 3.5** - Projected forest plantation area (Source: ACPWP 2007: 10)

What lays ahead in the macro-scale of global political economy of tropical forest plantations? As was already discussed, large producer countries led the way in expanding processing capacities in timber, pulp and other wood products. This is a positive trend from a developmental perspective, but its impacts are ambiguous. For a long time, supply to sawmills and pulp/paper mills was based on abundant raw material from natural forests, often acquired at below market prices (concessions). This was further enhanced by fiscal incentives and the restrictions on log exports. Today many countries are in a situation of industrial overcapacity. The scale of investment was enormous and it

was further encouraged by state subsidies and the assistance of international banks. As mentioned, this strategy is rational in the light of the tropical countries’ comparative advantage, resulting from the low wood prices, available workforce, and poor environmental regulation – coupled with state-of-the-art processing technologies acquired through foreign investment. Brazil was “so confident of its comparative advantages that it has undertaken a second wave of investments, \$7 billion in the next five years, and intends to have increased its pulp production by 45 percent by 2005, mainly for export” (Smouts 2003: 118).

This has changed the global economy visibly, but not fundamentally. South America’s exports of wood products almost doubled between 1995 and 2006, from \$6 billion to \$10 billion. And yet, the overall balance in processed wood products exports is still strongly weighed towards the developed countries, which account for 82% of exports (Gale and Haward 2011: 21). An important factor in the political economy of plantations is the identification of most powerful actors. The global market has since the mid-1990s seen the rise of powerful Multinational Corporations (MNCs) in both pulp/paper production and wood-product retail. Among the top 20 largest global forest and paper companies in 2012, 7 were from Europe, 7 from North America, 4 from Japan, and 2 from Australia and South Africa. In the top 100, the share of companies from emerging economies is 10% and for some years this has remained stable (PricewaterhouseCoopers 2012). Such giants as Wal-Mart, Ikea or Home Depot – are described as “category killers”, taking over whole supply chains in different categories (see: Figure 3.6). Due to their size and the leverage of the demand they generate, they exert “buyer-driven” power to control supply (Dauvergne and Lister 2011: 5 and 39). In the pulp and paper sector crucial Northern paper giants include International Paper from the United States and Stora Enso from Finland-Sweden, alongside some rising Southern pulp companies such as Fibria from Brazil and APP from Singapore (Kröger 2012).



**Figure 3.6** – Global timber commodity chain and the increase in profits (Source: own elaboration based on Dauvergne and Lister 2011).

It appears, however, that processing capacities exceed the supply of wood – even if natural forests are deforested illicitly. There is a path dependency in play. All new producing countries have, according to Smouts, reached “a point of no return”. Forest plantation area will have to be expanded very quickly, and the tropics and subtropics are an ideal geographical location due to great yields and short rotations.

“In an ideal world, plantation forests should cover the industry’s needs and by the same token lower the pressure on natural forests and their inhabitants. For the moment, reality is another matter. The sites available are not limitless in countries where the land access issue is a constant problem. Very often, plantation land has been wrested from dense forestland by displacing indigenous peoples with terrifying brutality. [...] Without very strict monitoring of plantation policy implementation, they can wind up increasing deforestation” (Smouts 2003: 120)

### **3.5 FROM THE POLITICAL ECONOMY TO PLANTATION PARADIGMS**

What remains unknown is – how this massive planting will be done? What will be the policies, governance modes, standards? How will social conflicts over land and income distribution be resolved? The political economy of tropical forest plantations forces to ask who will plant, what, on whose land and under what conditions?

There are some crucial aspects that need to be taken into account. The methodological Chapter 2 with the Figure 2.2 proposed to look at the technical aspects (land ownership modes, forest management and governance issues), ideational aspects (understanding of plantation, knowledge and expertise centers) and functional aspects (goals for planting, investment source, production potential).

Land status will be among the key factors in delimiting plantation paradigms. Different land ownership and use arrangements may be identified. Numerous studies have shown that large-scale forest plantations often create land use conflicts (e.g. Schirmer 2007, Kröger and Nylund 2012), especially since most of the recent plantation expansion occurs in densely populated and already extensively cultivated areas in South and South-East Asia (Rudel 2009: 549). While some proponents of planting trees for the global market calculate that there is ca. 1 billion hectares of land available for plantation in the tropics, it is often a land that someone makes land use claims to. What looks promising in a global macro-perspective can have very different, negative repercussions on the ground. Similarly, forest management actors are a crucial defining factor. Is it the state authorities, private companies or local people? The ownership of productive planted forests worldwide underwent significant changes in recent decades. While in 1990, 70% of planted forests were publically owned, the figure decreased to 54% in 2000 and 50% in 2005 (FAO 2005: 39). Corporate ownership ranged from 17% in 1990 to 18% in 2005 while smallholder ownership significantly increased from 12% in 1990 to 32% in 2005 (Ibidem). Governance patterns also differ in different plantation types and the top-down decision-making approach became challenged with different participatory elements. Ideational aspects will also be important in delimiting plantation paradigms, for example in plantation



justification. Are plantations established to provide certain resources or wider goals as developing of national economies, bringing export earnings etc.? What role are plantations supposed to play, how will it be justified to the local people and general public? Here the “forestry as progress” justification, modernity discourse, limits to growth narrative, ecological or sustainable development discourses are examples of such powerful ideational constructs affecting forestry activities (Arts *et al.* 2010, Bryant 1996). It is important to look at the sources of knowledge and expertise. Is it the local knowledge? Is it direct/indirect knowledge transfer? Do the companies have their own research centres or are state institutions or universities involved? Research on knowledge sources in Chinese plantations concludes that modern scientific knowledge is centralized and attached to the state authorities while indigenous knowledge is scattered and associated with low prestige of rural life (Congming 2004). But modern research on local knowledge proves that it does not contradict scientific knowledge, but rather expands it (Lindner and Pretzsch 2013).

Some functional aspects of plantations are also related to the political economy and should be studied for a careful categorization. There are different goals for planting, sometimes with one product produced on a mass scale, sometimes for multiple purposes. FAO reports the main end uses of productive plantations is sawlogs, followed by pulpwood/fibre, non-wood products and bioenergy (FAO 2005: 26). For protective plantations and smallholder plantation the end uses are protective services, NTFP, social and cultural services and fuelwood (Ibidem: 35). Investment source indicating the capital links in plantations is another concern of studies with a political economy edge. There are various investment arrangements regarding plantations with individuals, companies, cooperatives, partnerships, government-owned institutions or different public bodies. Other significant functional aspects are production potential and scale of plantations. Growth rates differ significantly among species and geographical locations, examples of MAI rates for selected species in different evaluations are provided in the Table 3.2 listed below.

Species	MAI - m <sup>3</sup> ha <sup>-1</sup> yr <sup>-1</sup>			
	FRA 2000	FAO 2000	FAO 1998	FAO 2002
Acacia magnium		8-19	10-15	15-37
Eucalyptus camaldulensis	15-30			10-21
Eucalyptus grandis	15-50			14-35
Eucalyptus urophylla	20-60			20-40
Gmelina arborea	12-50	12-19		16-28
Pinus elliottii			15-25	10-24
Pinus radiata	12-35		18-24	13-26
Tectona grandis	6-18	4-18	2-6.3	7-13

**Table 3.2** – MAI by species according to different sources (Source: Carle *et al.* 2003)

Such complexity in plantation characteristics and the historical trends and changes can be inductively studied. The remainder of this monograph tries to organize the plantation discourses to date. The next chapter will provide an overview of the historical changes in the discussed crucial aspect of plantation forestry – in this analysis termed *paradigms*, which will then be used to analyze current plantation case studies.

## Chapter 4 – Plantation Paradigms and a Global Perspective on Forest Plantations

Having established the global political economic context for plantation forestry, the analysis now moves to a historical analysis of the knowledge structures that organized plantation forestry for different purposes, around different scientific discourses and with different socio-economic implications. In studying the changes in understandings, definitions and priorities of plantation forestry, this analysis draws on epistemology and sociology of scientific knowledge. The concept of a *paradigm* is used to describe the discrete structure of knowledge that encompasses the understandings and impacts of plantations, and directs the policy and practice of plantation forestry. The first section reviews the existing literature on *paradigms* in forestry and plantation studies. Then, the typology of plantation paradigms is presented, set against the background of the changes in global politics and development approaches.<sup>13</sup> This should be understood as a discussion contribution in reflections on plantations. This inductively and interpretively derived typology is then applied to two national case studies – of Paraguay and Indonesia. The economic history of plantation forestry in both countries is analysed, structured around paradigm shifts and along the different indicators used to delimit paradigms.

### 4.1 ROOTS AND APPLICATIONS OF THE CONCEPT OF A *PARADIGM* IN FORESTRY

A paradigm is defined as “a set of assumptions, concepts, values, and practices that constitutes a way of viewing reality for the community that shares them, especially in an intellectual discipline” (American Heritage Dictionary 2009). In other words, paradigms are shared structures according to which (predominantly natural scientific) disciplines are organized (Kuhn 1996 [1962]). They are understood as answers to a set of questions about what is to be observed and scrutinized, what the dominant research questions are, and how they are posed and structured. Other important issues are the interpretation practices and the methodological apparatus used for the studies, as well as the social aspect of a paradigm, seen as “what members of a scientific community, and they alone, share” (Kuhn 1977: 293).

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<sup>13</sup> Main results of the paradigm analysis were published in: Szulecka *et al.* (2014).

In their social and political nature, paradigms are not stable, and science experiences paradigm shifts that alter the understanding of the role of science, the perceptions of reality and the available tools for inquiry. Handa (1986) introduced the concept of a *social paradigm*. He emphasized the social context which influences the dominant paradigms and causes shifts, which in turn influences the social sphere and the institutional setup. Similarly, Hall (1993) put forth the notion of a *policy paradigm*, generating longer periods of continuity in policy terms, punctuated by paradigm shifts when the system of ideas and standards are questioned and changed (pp. 279-280). Although Kuhn's (and related authors') ideas on paradigms in science as a whole have been criticized – as an error of collective judgment on the capacity of science to remain an independent, progressive force in the society (Fuller 2003) – the concept can be a useful tool in the historical analysis of the particular domain of plantation forestry in its socio-political entanglements. It provides an approach that helps to transcend the temporarily dominating approaches and discourses.

The concept of paradigms and the idea of paradigm change or shift have already been applied to the domain of forestry, albeit often in a rather general way. Mery *et al.* define forestry paradigms as “the ways in which forests are perceived, used and conserved” (2005: 14). This rightly points to the dual nature of paradigms, encompassing both attitudes and practices towards forests, but the authors only distinguish two historical paradigms – ‘rationalist’ and that of ‘sustainable development’. In their impressive historical study, Arts *et al.* (2010) trace the evolution of a much wider set of forestry “discourses”, yet keep it separate from an analysis of actual practices. Sayer and Elliot (2005) in turn depart from the tension between conservation and service provision, coming up with a convincing overview of changing paradigms in forest *governance*. Both publications, however, do not capture the multidimensionality of paradigms and do not address the specific issues of planted forests. On the other hand, Liu *et al.* (2005) and Galloway *et al.* (2005) recognize a wide range of factors which constitute the context for forestry (such as management, governance, livelihoods and environmental services), and discuss plantation forests as a separate issue, but leave the concept of paradigm un-theorised, pointing rather to the practical impacts of ‘shifts’ in different issue areas.

In studying the paradigms of plantation forestry it is necessary to look at both the levels of social structures and agency (cf. Stones 2007). The first level is linked to the post-structuralist concept of *discourse* as a “manifestation of power through language” (cf. Foucault 1972); throughout the study

the word “discourse” is used in the sense of a “mode of speaking” about a certain topic, the dominant threads and the limitations for acceptable speech acts. The second level refers to the actions of the subjects able to create paradigms and empowered to cause their shifts, well captured by the concept of *epistemic community* (Haas 1989), explained in the methodological Chapter 2. The epistemic community influences the policymaking realm by providing expert knowledge, and in this way setting the agendas for negotiations and framing policy options.

## **4.2 GLOBAL POLITICAL AND SOCIAL CONTEXT FOR PLANTATION FORESTRY**

The social activity of tree planting can be placed in a broader context of human development, history and economic thought. With the migration of peoples, seeds have been spread over new areas and valuable species have been artificially propagated, i.e. myrrh trees in Egypt, frankincense in southern Arabia, olive trees in the Mediterranean or stone pines and firs brought to the British Isles (Bass 1992, Evans 2009a). As long as natural forests were widely available, tree planting was very limited and aimed particularly at cultivating valued species for aesthetic, cultural and religious purposes. This situation changed initially in Europe of the late Middle Ages, where the shortage of natural forests in the 14<sup>th</sup> century resulted in the need for large scale reforestation. Savill and Evans (1986: 8) point out that up until the beginning of 19<sup>th</sup> century most of the planting was conducted with native species in traditional forest areas. It was in Germany and through the influence of Heinrich Cotta that “new plantation forestry”, involving species conversion and large scale afforestation was first introduced and popularized. This shift signals the move from a pre-industrial to an industrial mind-set in tree planting, and the practices developed in moderate zones had a very significant influence on emerging tropical plantations.

The development of plantations in tropical areas started with the colonial influence and can be traced back to the 16<sup>th</sup> and 17<sup>th</sup> centuries (Evans and Turnbull 2009). Early activities in the colonies concentrated on small scale valuable species plantation (i.e. teak) and generally did not promote larger tree-planting projects, seeing them as expensive and insecure long-term investments (Bass 1992). At the peak of the colonial period, plantations were developed for strategic (shipbuilding) and commercial purposes, with plantation forestry being framed and encouraged as “progress”. During this period, between 1905 and 1912, the first “Eucalyptus boom” took place (Santos in: Spirko 2010), particularly in South America (Brazil, Uruguay)

and Africa (Ethiopia, South Africa). However, detailed data on plantation area were not available at that time. In the decolonization era, the newly independent countries continued the “forestry as progress” justification and the State-led plantation model spread worldwide. Centralized plantation activities were also better documented and reported in terms of scale.

After World War II, the dominant economic growth approach and modernization calls, with emphasis on economic growth per capita and direct technology transfer (Kirkpatrick *et al.* 2002), affected the way plantations were organized. Large scale planting programs were promoted by donors and governments (see: 3.1 and footnote 9). Plantations were perceived as a strategy for industrial growth and tree-planting gained global recognition. This was reflected on the agendas of the World Forestry Congress held for the first time in the global South in 1954 (Unasylva 1954) and the FAO World Symposium on Man-made Forests held in Australia in the following decade (Zaman 1967). In 1968 the World Bank started to finance large plantations (Evans and Turnbull 2009: 30). From the 1960s, softwood plantations (predominantly pine) gained importance with the growing pulp and paper industry (see: Annex to Chapter 3).

The research interest in technology adaptation leading to the Green Revolution in those years left a mark on the subsequent plantation approaches, reviving the so-called “agroforestry” model – an old concept re-invigorated to optimize the combination of both agricultural and forestry crops (Bene *et al.* 1977). The dominant emphasis in development aid, as well as that of plantation forestry, of the 1950s and 1960s began to cause widespread criticism, once the “externalities” of growth became more visible. The *per capita growth* approach, treating plantations as an element of a macro-economic, industrial design, encountered growing opposition because it was not fulfilling its promises. The late 1960s and early 1970s marked a shift in the general understanding of aid, emphasizing equitable growth (including employment, income distribution and basic human needs issues) (Jolly 2002) as well as environmental awareness (the concept of “responsible forestry”), which began the evolution towards sustainable development and the re-distributive mechanisms for poverty reduction. From the 1970s, the notion of *growth with equity* gained importance and Integrated Rural Development together with microfinance propagation dominated the agenda (Kirkpatrick *et al.* 2002). Social forestry has been applied to plantations by development agencies and other actors in order to better address multiple local needs.

The focus was reversed in the following decade, when a larger, global shift, associated with the economic impacts of the post-1973 economic crisis, led to a grand re-conceptualization of the economy according to (neo-)liberal ideas and the so called “Washington Consensus”, promoting privatization and market liberalization, reducing trade barriers and the role of the State (institutional restructuring). In forest plantations, this led to the ITTO Agreement in 1983, focusing on the worldwide tropical timber economy and empowering industrial international timber trade players (forest plantation owners, producers, importers). The last decades have shown that forest plantations in the tropics can be vital financial investments.<sup>14</sup> These developments encouraged the second boom of Eucalyptus plantations during the 1980s due to that species’ potential for biomass production and very high growth rates. Used for large scale industrial plantations, Eucalyptus became the most widely planted species in the world. But at the same time from the 1980s onwards, especially at the end of the Cold War, the voice of the civil society gained some attention and recognition, supporting social forestry and increasing the role of non-governmental organizations in tree-planting. At the beginning of the 1990s, a huge increase of NGOs active in the forestry sector could be observed.<sup>15</sup>

In the 1990s global thinking and transboundary concerns regarding deforestation, sustainability or climate change led to the global governance architecture with institutions, conventions and fora trying to establish dialogue and in some cases coordinate common efforts to address pressing global problems (Kanowski and Savill 1992). However, forestry has never been regulated in the form of a single global regime such as a UN convention. Such attempts were conducted within the market based approach firstly by the Intergovernmental Panel on Forests (IPF) and later by the Intergovernmental Forum on Forests (IFF). Despite years of negotiations, no legally binding instrument could be agreed on (see: section 3.3).

After the Rio Earth Summit of 1992 and the Millennium Development Goals, new global discourses are redefining the role forests (Brown 2002), and thus plantations should play in the 21<sup>st</sup> century by stressing their importance in poverty alleviation, climate change mitigation (carbon sinks) and adaptation (e.g. mangrove plantations), biodiversity conservation and

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<sup>14</sup> Especially the pulp and paper production strongly shifted to Southern tropical countries, where the climate is more suitable for fast growing trees. Moreover, land in these regions is more affordable, wages are low and there are generally few barriers for industrial expansion (Lang 2007).

<sup>15</sup> While during the 9<sup>th</sup> World Forestry Congress in 1985, the General Director referred to “hundreds of NGOs”, six years later, at the 10<sup>th</sup> Congress in 1991, “literally thousands of NGOs” were mentioned (Unasylva 1985, Unasylva 1991). See: Annex to Chapter 4.

desertification debates (cf. Bauhus and Schmerbeck 2010, Böttcher and Lindner 2010). These broadens the traditional division between the conservative, livelihood and industrial plantations while new inputs and expectations create tensions with the existing global forestry regime, an issue that will be discussed at a later stage.

### 4.3 TYPOLOGY OF PLANTATION PARADIGMS

Based on the discussed interrelation of plantation politics with global historical and economic developments and the proposed operationalization indicators for a plantation paradigm, a categorization of paradigms in plantation forestry with six main categories and some sub-variations can be proposed. The qualitative methodology applied in the analysis was already explained in detail in Chapter 2. It builds on the analysis of important policy milestones, archival research at FAO, plantation expert interviews, a discourse and content analysis of the FAO archival documents and World Forestry Congresses' outputs as well as a content analysis of the "Unasyuva" journal (see: Annex to Chapter 4). The typology is extensively explained in this section, providing the rationale for delimiting all the single paradigms and placing it in a wider historical global context. It should be treated as a reference point to the plantation developments worldwide and as any generalization attempt it offers wide explanatory power that is traded for local peculiarities and specifications. Therefore the next subchapter applies the paradigm categories to the specific plantation developments in Paraguay and Indonesia, where it takes into the account the particular national and local situations and builds on existing historical sources and research conducted in both countries.

At the beginning "man-made forests" were planted according to what can be called a *pre-industrial* paradigm, where plantations provided particular goods or services to human communities. It is important to emphasize that until the development of modern, industrial capitalism, these services (aesthetic, cultural, provision of forest products etc.) were not privatized and not quantified in monetary terms. Also, as Pretzsch (2003) notes the forest land was either a *common* or a *dominium*, but even as the latter certain traditional rights for forest use were provided. The land ownership mode can be therefore classified as *non-exclusive*. At this abstract and general level this can be said both of Europe, or the West as well as the non-European contexts.

PARADIGM (approximate period)	Land Ownership/ Forest Management	Understandings / Goals of Plantations	Governance	Knowledge and Expertise	Capital Source / Potential Growth Rate <sup>16</sup>
1. PRE-INDUSTRIAL (until the 19 <sup>th</sup> century)	Non-exclusive ownership  Community-based	Material goods and non-material services equally important, production among many other goals	Bottom-up approach	Local	Individual and community planting, low capital requirement Low growth rate
2.a INDUSTRIAL COLONIAL (ca. 1900-1960)	Exclusive ownership Concentration of land  Central control, designated authorities	Economic goals, “progress” (technocratic forestry)	Top-down (colonial State- plantations)	European/ Northern scientific forestry	Imperial enterprises, first big capital investments in plantations Low to moderate growth rate (mainly valuable hardwood)
2.b INDUSTRIAL POST-COLONIAL (NATIONAL) (1950- present)	Central control, National Forest Departments		Top-down (newly independent State -plantations)	National scientific forestry educated in Europe	State incentives  Moderate growth rate (both softwood and hardwood)
3. PROTECTIVE  (ca. 1960-present)	Public; State and community land (generally non- exclusive)  National Forest Administration	Protective function of planting trees (regulating water, windbreaks, protecting soil against erosion etc.) Plantation’s function perceived both in local and broader terms	Usually top-down, regulated by environmental legislation	National  Scientific, local, national priorities	State-financed or compensated by state  Low production (not a goal), similar to natural forests

<sup>16</sup> Precise and comparable general data on productivity (and therefore on production potential) of different types of tropical forest plantations are not available. The only existing data are referring to quite recent periods and specific species (e.g. Carle *et al.* 2003, Carle and Holgrem 2008) and/or genera (e.g. Tiarks *et al.* 1998). A comparison of Mean Annual Increments provided by the FAO plantation database and the FAO reports show quite high differences depending on the source of the data and species. Thus, to calculate and estimate the full production potential on the basis of productivity is problematic. It is clear, however, that different plantation types display significantly different growth rates and this factor needs to be acknowledged when plantation paradigms are discussed and compared. To illustrate the growth rate differences, the table provides information on a simple tripartite scale: low, moderate and high. Exemplary growth rates and clues about production potentials of plantations can be drawn from the assessment of 16 plantation experimental plots in tropical and sub-tropical sites analyzed in the period 1995-2005 by CIFOR, where a range of annual growth rate is reported varying from 6 to 46 m<sup>3</sup>/ha/year for tropical and sub-tropical plantations (with 4 main species taken into consideration) (Nambiar and Kallio 2008).



4. SOCIAL (ca. 1970-present)	State and village common land, regulated community use (non-exclusive)  Participatory management	Equitable growth (responsible forestry)	Horizontal	Multiple; local knowledge, adapted technology transfer  Participatory local governance	Community investment, projects financed by bilateral, multilateral organizations, NGOs, private foundations  Moderate growth rate (lower productivity in agroforestry systems)
5.a NEOLIBERAL (ca. 1980-present)	Exclusive, private land accumulation Private	Profit	Top-down	International Scientific Forestry	Private sector investments, multinational capital ventures,  High growth rate
5.b NEOLIBERAL MODIFIED (ca. 1990 – present)	Exclusive, with partnerships agreements  Outgrower schemes		Top-down with participatory elements	International Scientific Forestry, Local Knowledge	Private sector investments with farmers contribution (land)  Can reach the growth rate of neo-liberal, although usually lower
6. GLOBAL POLITICAL (1992-present)	Project dependent, i.e. state, private, Lease agreements.	Resources supply for the global market Global/National	UNFF	Political framing, International Experts, Negotiations, Global priorities	Private and state investors  High growth rate
		Climate Change Global	UNFCCC		Private and state investors  Still unclear (few and recent projects, i.e. CDM)
	Biodiversity Global/Local	UNCBD	State incentives  Low production (not a goal), similar to natural forests		
	Desertification Global/Local	UNCCD	State and community driven  Very low growth rate		

**Table 4.1** – Paradigms in Plantation Forestry (Source: own elaboration)

The other important elements of the *pre-industrial* paradigm are community based forest management practices and a certain “micro” perspective on plantations, which were at the time small scale, and developed according to local needs in a bottom-up manner. Lastly, plantations were based on traditional forms of knowledge, in which the emerging natural science disciplines (botany, forestry) were not yet prioritized (Shirley 1964). The interference of an exploitative approach to forests as sources of wood with traditional, community-oriented local forest use rights began at the dawn of the capitalist system, when late-medieval cities began to pressure the surrounding farmlands in a manner later repeated in the metropoly-colony relationship (Salvestrini 2000). It is important to note, that the then still abundant natural forests were able to fulfill the demand on timber and non-timber products and therefore the level of productivity was low.

This last factor rapidly changed with the outbreak of the industrial revolution. Several large scale processes influence the move from the traditional, *pre-industrial* plantation paradigm to the *industrial* one. Firstly, the industrial, exhaustive mode of production started to dominate the Western world, and quickly also its colonies. Secondly, coupled with it, came the modern industrial capitalism, with its emphasis on private, exclusive property rights. Whereas the land in Europe was most often parceled already, and thus expensive to obtain, the status of land in the colonies was less clear. Traditional land tenure of the colonized peoples was overlooked, and the European understanding of property was transplanted to non-Western contexts, an ideational move that creates unresolved conflicts until today. Thirdly, the scientific revolution of the Enlightenment introduced a formalized practice of science, which marginalized competing forms of knowledge (i.e. local) and constituted the expert status of Western foresters as the group monopolizing the rational decision making regarding plantations (Steinlin and Pretzsch 1984). In the modern scientific discipline of forestry, Gale argues, the keystone concept is sustained-yield management.

“The basic logic of the sustained-yield concept focuses the attention of forest managers on the production of a single crop - timber – for sale in the marketplace and distracts forest managers from their ultimate objective, which is the maintenance of forest ecosystem integrity. Once forest managers commence operations according to the principles of sustained yield, they accept that the major goal of forest management is timber production. Attention focuses on the best means of enhancing the timber productivity of the forest, necessitating 'trade-offs' with other forest

functions such as biodiversity protection, catchment management, and the harvesting of non-timber forest products” (Gale 1998: 219-220).<sup>17</sup>

Whereas decolonization meant a very important political shift in the developing world, in plantation forestry the change was not that significant. That is why the new mode of thinking about planted forests can be seen as an extension of the industrial paradigm, this time in *post-colonial* (or – *national*) form. A change occurred in the organization of plantation management. Various colonial authorities, either façade or real, were replaced by national forestry authorities and newly independent states and governments became key-actors (for the role of governments and state-led incentives in tree planting see: Zaman 1967, Williams 2001, Bull *et al.* 2006). This change had no structural impacts, plantation governance remained as detached from the local populations “on the ground” as that conducted under the colonial paradigm. National forestry agencies were the site of expertise and “were largely staffed by people who shared the same educational background, and they tended to develop strong internal cultures and to harbor entrenched views about how forests should be managed” (Sayer and Elliot 2005: 40). The exclusive land ownership form – either private or national – was maintained (Brown 1967), as well as their main goals as “productive plantations” (i.e. mainly to satisfy the growing demand for industrial timber) (FAO Secretariat 1967, Westoby 1967). In the state-promoted industrial plantations, the monoculture debate started, with many environmental groups starting to oppose monoculture fast-growing and often genetically modified tree species as a threat to biodiversity (Cossalter and Pye-Smith 2003).

In a somewhat parallel way to industrial “productive” plantations (FAO Secretariat 1967), a different form of plantations developed – protective ones, gradually increasing in the last 20 years. Often planted on state-owned land, their governance patterns depend largely on country-specific environmental regulations. It is difficult to pinpoint the moment, when protective plantations are first developed. In some forms, the protective function of planted forests was perhaps known since pre-modern times. However, in their modern form, they are also linked to modern forestry science as the dominant form of knowledge. With pre-industrial plantations they share their service orientation, which is not meant to generate profit in the immediate sense (although such suggestions were also made, see: Kolar 1961). Their functions can be as different as regulating water, creating windbreaks, protecting soil against erosion and

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<sup>17</sup> Gale is not specific about the exact period in which this emerges, he is suggesting, however, that sustained-yield management is characteristic of Western scientific forestry and has been additionally amplified by a market orientation as the foundation of the modern timber regime.

preventing landslides. The scope adopted is more at the meso-level linking local and national protection conditions. The spectrum of environmental functions plantations can play is wide, but it is often pointed out that biodiversity protection is not their major strength (given that most are monocultures). While protective plantations can provide numerous environmental goals, productive plantations may bring adverse effects. The majority of NGOs warns against the rapid expansion of monoculture plantations due to the biodiversity losses, impact on water regimes, application of chemicals etc. (Global Forest Coalition 2014). This view is contested by some authors who argue that plantation forestry and biodiversity is not an “oxymoron” but an “opportunity” (Brockerhoff *et al.* 2009). It is clear that the environmental effect of forest plantations is case-specific and depends on what land is replaced, what species are being planted, on what scale, what are the rotation cycles, what substances and machines are being used etc.

The dominant emphasis in development aid, as well as that of plantation forestry, of the 1950s and 60s began to cause widespread criticism, once the “externalities” of growth became more visible. The “per capita” growth approach, treating plantations as an element of a macro-economic, industrial design, was running out, because it was not fulfilling its promises. The late 1960s and early 1970s marked a shift in the general understanding of aid, emphasizing equitable growth, as well as environmental awareness related to the concept of “responsible forestry”, which began the evolution towards sustainable development. In terms of plantation paradigms, this resulted in a radical shift to what can be termed the *social paradigm*. Many previously marginalized actors and marginalized discourses were to play a role (Ngamsomsuke and Saenchai 1987, FAO 1994). An emphasis on participatory orientation in governance was coupled with a non-exclusive perspective on land ownership, which acknowledged the needs of various stakeholders and was closer to the concept of the planted forest as a *common* (FAO 1987). Plantation forestry in this paradigm was also growing more receptive to previously excluded forms of knowledge (Bacon 1967), and in its present form (especially clear in some NGO-led plantations) aims at the reinvigoration of local forestry knowledge, which is area and case specific. Within this mind-set it was then acknowledged that “there are multiple ways of managing forests lands, and that what is desirable in one location at a point in time may well be different from what is wanted in another place or a different time” (Sayer and Elliot 2005: 40). In its initial form, it meant that uniform ideas of technology transfer (whatever works in the North should also eventually work in the South), were adapted to local specificities. In this sense also the paradigm has a more balanced scope, attempting (not always successfully) to

include top-down planning (development) with bottom-up signals. While the orthodoxy before was that “a well-protected forest was a forest without inhabitants”, the idea of a social approach and “participatory management” have now become widely accepted (Smouts 2003: 81). This shift, however, is far from being self-evident. Not only does it stand in opposition to a profit maximizing market approach, but also (possibly) to the protective paradigm. That switch to managing forest resources and plantations ‘for the benefit of all’ is “a mental operation that [...] cannot be taken for granted. In 1998, a WWF member was still heard protesting against the “complete control” of social scientists to the detriment of botanists and naturalists, against the “growth of human rights and the decline of the rights of nature” (Ibidem).

A larger, global ideational shift, associated with the economic impacts of the 1970s crisis, led to the neo-liberal direction of economic policies. One of the characteristics of this structure is that it extends beyond economy (in a similar way as the notion of “progress” before) and emphasizes “growth”, which is understood in monetary terms. As one expert put it: “no more time must be lost to start big industrial pulpwood afforestation programmes” (Deville 1975: 3). The emphasis on privatization and deregulation left an important imprint on development aid and a very clear one on plantation forestry. The last decade has proven that forest plantations in the tropics can be vital financial investments. With the growing importance of private, transnational actors, the question of land availability for investment purposes became vital.

With the neo-liberal ideas (associated with the concepts of growth, privatization, and deregulation), large industrial forest plantations for pulp production moved to the South due to land “availability”, low labor input and weak environmental regulations (Carrere and Lohmann 1996). Although this new influx of capital into plantations had private sources, it was still to a large extent driven by the hosting states through political and economic (fiscal) incentives. This was in line with approach that was expected from developing states under the then dominant “Washington Consensus” development model. It advocated trade liberalization and export-led growth coupled with privatization and labor market flexibility and “jumpstarted the conversion of forests into industrial plantations” (Tauli-Corpuz and Tamang 2007: 5). In 1992 70% of the total high-yield planting was in the South, while as much as 84% was on private lands (Moulton *et al.* 1993 in: Sedjo 1999). The inclusive tendencies of social forestry were countered with a return to exclusive modes of land ownership and private property rights guaranteed by the national governments. Powerful private investors were also often able to secure government non-interference in plantation management, which can be observed as the role of national

agencies diminishes, even in the eyes of international organizations and UN agendas (compare: Bayly 1991). The goal of plantations in this paradigm is profit maximization, and although this is meant to create national growth, the link is not as clear as was in the case of “plantations as tools of progress” – the rationale of tree-planting under the national paradigm. This approach is reflected in the way market-economic arguments have diffused into forestry curricula, providing justification of forest management. As Krott puts it: “The market economy system of the forest industry is geared towards regulating the use of forests with the goal of highest efficiency according to the economic allocation model” (2005: 192). Under this paradigm, very high growth rates are being achieved, as for example the official growth rate for Eucalyptus in Brazil ranges between 45 – 60 m<sup>3</sup> ha<sup>-1</sup> year<sup>-1</sup> but according to some sources certain GMOs can even reach 90 m<sup>3</sup> ha<sup>-1</sup> year<sup>-1</sup> (Evans and Turnbull 2009). This drive towards narrowly defined economic benefits was already visible in the 1960s (Wendelken 1967).

The corporate, *neo-liberal* paradigm, as perhaps no other since the *industrial colonial/national* one, creates conflicts, most importantly over land tenure and land use rights (in the face of which many societal opposition movements developed; the Mapuche in Chile or Thai movements against the large pulp and paper transnational companies may serve as examples [Pye 2005]). For those reasons, a modification of the paradigm can be observed, blending certain limited ideas about non-exclusive land use (Varmola and Carle 2002). An example are the *outgrower schemes* (Race and Desmond 2001). However, this is sometimes only a means to merge private management with local property rights, but not necessarily land ownership. In some cases the dominant scientific forestry is also reinforced with local traditions, although the goal is still financial profit.

The last, still emerging paradigm can be termed *global-political*. It grows out from a general ideational shift towards “global thinking”. The four sub-strands, or “offshoots” of this paradigm, are looking at plantations through the lens of traditional wood resources, climate change, biodiversity and combating desertification. This implies that while science plays a crucial role, forestry science<sup>18</sup> is no longer the absolute dominant discourse for plantations. Biology, climatology and other disciplines are the discourses which set the political agenda and from which the definitions of plantation goals and understandings emerge. Project-based

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<sup>18</sup> Forestry is defined as the theory and practice of all that constitutes the creation, conservation and scientific management of forests and the utilization of their resources (Anonymous 1966). It is broader than silviculture which concentrates on a stand level.

planning and management, typical for plantations of these new types, is on the one hand flexible, but on the other – maintains a limited temporal scope, rather short-term. The high politicization of this process needs to be clearly underlined. The question of land ownership is not settled, often case dependent, linked to the actors responsible for planting. Forest plantation management becomes involved in the multi-polar and fluid global governance. That is why it is difficult to point to the most important authorities (although all private, national policymaking and third sector remain important) and the regulations are often contradictory (as for example between plantations seen from resource-based, climate change and biodiversity perspectives). The outlook also varies, although the global justifications of plantation efforts are a very important change. Forests, previously perceived as national resources, have with time, and especially after the Rio Earth Summit, shifted to be seen as “global commons”, or a “global heritage.” This is related to the acknowledgement of deforestation as a problem in the global scale – making forests (also planted) a global resource. However the UNFF is defending the traditional view of forests as national resources under the sovereign authority of states and advocates a very soft law role of a global forestry regime as disseminating information and providing data (Brown 2002).

The *global political* paradigm and its contradictory streams change the previous step-wise evolution of paradigms in plantations. Previously there were similar contradictions, as between the *industrial vs. protective* or *neo-liberal vs. social*. However, they evolved slowly and as a result of certain externalities. By contrast, the global political paradigm embedded in the UN institutional framework, gives at the same time many new views, ideas and incentives to organize tree planting, which are not compatible.

The initial development of paradigms was closer to the Kuhn’s (1996 [1962]) paradigm revolutions (*pre-industrial to industrial*) while subsequent developments are examples of paradigm evolution (*industrial colonial to industrial national* or *neoliberal to neoliberal-modified*). Since the 1990s, more “policy stretching” can be observed, that is enlarging the policy paradigm area and the inclusion of new concerns, actors and institutions as well as institutional layering with decreasing intellectual coherence within the original paradigm (compare: Feindt and Flynn 2009, Feindt 2010).

## 4.4 EMPIRICAL APPLICATION OF THE PARADIGM TYPOLOGY

### 4.4.1 Country Case I: Paradigms and the development of plantations in Paraguay

Tree planting activity on a larger scale and in an institutionalized form is a relatively new phenomenon in Paraguay, dating back to the 1970s. Although trees have been planted before for ornamental purposes, to give shade or for fruit, it was the natural forest (including the Atlantic Forest) that provided the local population and colonial authorities with the materials they needed. But with the extremely high deforestation in the second half of the 20<sup>th</sup> century,<sup>19</sup> tree-planting started to no longer be an option but a necessity. According to the FAO Thematic Study, Paraguay had 23 thousand hectares of plantations in 1990, 36 thousand in 2000 and 43 thousand in 2005, a very moderate performance compared to the rapid plantation development in Argentina, Chile, Brazil, Peru or Uruguay. Because of the late interest in plantations in Paraguay, not all historical plantation paradigms could be identified (i.e. no industrial colonial paradigm plantations) and many developed later compared to the plantation experience in other countries, including the neighboring Brazil and Argentina.

#### *National Paradigm (1970s/80s)*

The Paraguayan legal forestry regime has been established in 1973 with the Law n. 422. At that point the National Forestry Service has been created and the state administration intended to centralize forestry issues. It addressed the pressing deforestation problem with a 10-year national reforestation program starting in 1975. The reason for state engagement in plantations was the alarming deforestation rate in the second half of the 20<sup>th</sup> century. The goal of the state program was to achieve 90 thousand hectares of plantations within one decade but due to a number of factors, the Paraguayan government was not able to drive the development of the envisaged plantation estates. *The program, due to a lack of funding and institutional support, never approached its stated goals. The area reforested over the first 5 years of the program was estimated at roughly 5 thousand hectares (...) Funding was cut and the program was virtually abandoned after the fifth year* (Evans 1988: 51). The national reforestation program proved disappointing and the state withdraw from the direct, active role in planting. Later it preferred to attract the private sector to invest in plantations or encourage smallholders to establish plantations.

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<sup>19</sup> Depending on the source, the annual deforestation rate in Paraguay varies between 0,5 and 3,3% (Evans and Rombold 1984: 211, Quintana and Morse 2005: 67).



Paradigm	INDUSTRIAL NATIONAL	NEOLIBERAL	NEOLIBERAL – MODIFIED	SOCIAL	GLOBAL POLITICAL
Location	Eastern Paraguay	Eastern Paraguay	Itapúa	Eastern Paraguay	Paraguarí
Time	1970s/80s	After 1995	After 2000	1980s – today	2003 -
Actors	The National Forestry Service	Companies, often with foreign capital	Cooperative Colonias Unidas	Development agencies	JIRCAS, INFONA
Species	Mainly exotics: Eucalyptus and Pinus, some attempts with native species Cedrella fissilis	Exotics, mainly Eucalyptus	Exotics, Eucalyptus	Exotics and native species	Eucalyptus, Grevillea
Land status	State land (research centers) and private land	Corporate owned	Contracts on smallholder land	Smallholder land	Smallholder land
Management	Monoculture	Monoculture, Silvopasture	Monoculture	Agroforestry	Agroforestry
Finance	State for profit	Private for profit	Partnership agreements	External funds	External funds, national expertise
Products	Timber and fuelwood for the industry (sugar mills)	Logs, later value added: plywood, furniture etc.	Fuelwood	Timber for construction, for local industries, fuelwood, NTFPs	CERs, ecosystem services, timber for construction, for local industries, fuelwood, NTFPs
Justification	Combating deforestation	Profit at the plantation level	Profit for farmers, energetic self-sufficiency for the cooperative	Cash crop, saving account, NTFPs – for local needs	Carbon sequestration, local environmental services, local fuelwood and cash crops

**Table 4.2** – Emerging paradigms in Paraguayan timber plantations in comparison  
(Source: own elaboration)

### *Social paradigm (from 1980s)*

The social paradigm in tree planting in Paraguay has been particularly promoted by foreign aid agencies. Firstly, in 1980 a project was started by the Forestry Service, the Paraguayan Agricultural Extension Service with assistance of the US Peace Corps and the Swiss Technical Mission. It promoted reforestation by small farmers, establishment of tree nurseries and development of forestry innovations (Evans 1988: 51). *Melia azedarach* known in the region as ‘Paraiso Gigante’, an introduced Asian species, was promoted by the project. However with the change of the Swiss Technical Mission director in 1983 the donors lost the interest in the project. The National Forestry Service did not continue without the external support, due to the lack of funds and the unprofitability of the project (Evans 1988: 53). Recently, the PMRN project of the German Development Agency started in the year 2003 under the banner of sustainable management of natural resources. One of the interventions has been reforestation with both exotic and native species. It is estimated that under the project work with small producers, about 3500 ha of land has been planted (the PMRN plantation as a case study is further discussed in 5.1.1).

Time	Relevant developments of Paraguay's timber plantations
1973	Forestry Law n. 422
1970s/80s	National plan under the Law n. 422/73, National Reforestation Plan, 10025 ha planted
1991-1994	Reforestation with energetic purposes, 1763 hectares planted
1992-1993	Compensation regime (Decree n. 14047), 1227 hectares planted
1997-1998	Model forests, 115 hectares planted
1996-2004	Plantations under the Law n. 536/95, 34023 hectares planted
2008	The National Forestry Service has been replaced by the National Forestry Institute (INFONA) as an independent forestry expertise institution, losing its previous dependence from the Ministry of Agriculture and Livestock (Law n. 3464)
2010	Plantation area added under monitoring of INFONA: 8940 hectares
2011	Plantation area added under monitoring of INFONA: 10010 hectares

**Table 4.3** – Milestones in Paraguayan timber plantation development (Source: INFONA 2011)

The social paradigm brought interesting local site specific solutions. It introduced plantation related knowledge to many poor regions in the countryside and proved that plantations may be an attractive option for farm diversification. Under the social paradigm both native and exotic plantations have been established [especially with Eucalyptus, Pine, *Melia azedarach*, Peterevy (*Cordia trichotoma*), Cedro (*Cedrela fissilis* and *Cedrela tubiflora*), Lapacho (*Tabebuia impetiginosa*), Yvyra pyta (*Peltophorum dubium*), Kurupay (*Anadenanthera colubrine* and *Parapiptadenia rigida*), Yvyra ju (*Albizia hassleri*), Guajayvi (*Patagonula americana*) and Guatambu (*Balfourodendron riedelianum*)] and local people learned that plantation benefits range from fuelwood, construction, NTFPs to environmental services and that such a land use may be successfully combined with agriculture and livestock keeping (PMRN 2009, PMRN 2011).

Key actors operating under the social paradigm are foreign aid donors that realized tree planting is a substantial component for sustainable rural development. Plantations are justified due to a number of reasons, from local cash crops, serving as saving accounts, providing fuelwood, construction material, NTFPs or providing shade and improving the local soil conditions.

### ***Neoliberal Paradigm (after 1995)***

The Law no. 536 had visible impact on the plantation sector in Paraguay, as the country saw new projects of afforestation and reforestation that have been implemented since 1995. According to the new “law of incentives” the state was compensating plantation owners, repaying 75% of site preparation, plantation and maintenance costs for the initial three years after planting (Law no. 536). The law of incentives encouraged bigger private corporate plantation investments. It attracted the Shell Group to invest in *Eucalyptus grandis* and

*Eucalyptus urophylla* plantations in Alto Parana and Caazapá. Some 7000 ha of plantations was later taken over by the Argentinian company POMERA (analyzed in detail in 5.1.4).

Another example is the reforestation of Copetrol that has been launched in 1997. The company possesses the largest plantation area in the country – 13 000ha (Copetrol 2012). In the department of Ñeembucu and Concepción it planted *Eucalyptus camandulensis*, in the department of San Pedro *Melia azedarach*. The third big company organizing commercial timber plantation is *Ganadera Vista Alegre (VASA)* with 3500 hectares of Eucalyptus and Teak in the San Pedro department.

Plantations under the neoliberal paradigm are monocultures of exotic species; sometimes also the silvopastoral model is applied. Trees are planted as industrial roundwood for the national market and exportation. There are no developed value added chains, so for the companies the profits are generated at the plantation level. However, compared with other land uses (agriculture, especially soy bean or cattle breeding), plantations are not the most lucrative business.

#### ***Neoliberal-modified Paradigm (after 2000)***

An interesting and innovative plantation approach in Paraguay that can be identified as the neoliberal modified paradigm is reforestation programme of the cooperative Colonias Unidas. It can be classified as the modification of the neoliberal paradigm as it combines commercial market approach with smallholder land ownership and involvement of local farmers.

In 2000, the farmers' cooperative "Colonias Unidas" in Itapúa started to sign contracts with local landholders to plant Eucalyptus trees for fuelwood purposes. It gives the necessary credit for plants and other necessary services (cleaning, insect control etc.). In return the producer needs to sell fuelwood to the cooperative to pay back the credit obtained. The rest of the plantation wood may be sold by the owner on the market price for the cooperative or the owner may look for a different wood buyer. Slightly more than 10 years after the project start, it is estimated that an area of 3000ha has been planted under this scheme. The project proves that forest plantations may be successfully organized at the local level and they can offer attractive options both for the industry and landholders. Such plantations have not been widely replicated yet, but assuming that this is a recent development, it can be an attractive option to develop the future plantation estate in the country under the neoliberal modified paradigm. Outgrower scheme plantations in Colonias Unidas are further analyzed in 5.1.3.

### ***Global political Paradigm (from 2003)***

Paraguay belongs to the few states, where a Clean Development Mechanism (CDM) plantation has been initiated and underwent the complicated validation procedures. The CDM plantation has been established in the Paraguari region implemented by the Japan International Research Center for Agricultural Sciences (JIRCAS) with the cooperation of INFONA. The project was launched in 2003 and approved a complicated methodology allowing for obtaining of the carbon emission reduction certificates (CERs). With a small scale (215 hectares of *Eucalyptus* and *Grevillea robusta*) it constitutes nevertheless an important development in bridging the global climate change debate with local action (CDM 2009). The CDM plantation is further investigated as a case study in 5.1.2.

## **4.4.2 Country Case II: Paradigms and the development of plantations in Indonesia**

### ***Colonial Paradigm (1650s- 1940s)***

Although tree planting in Indonesia must have been practiced in the pre-industrial era, the first institutionalization and regulations of this sector were introduced under the colonial rule. Small scale timber plantations, predominantly teak trial plots, carried out by the Dutch colonial administration in Indonesia were reported already in 1650 (Bass 1992: 58). In this period, colonial powers were marginally involved in plantations worldwide, trying rather to extract natural resources from the colonies and to avoid long-term investments. Teak timber had excellent properties for shipbuilding and other construction, due to its weather and vermin resistance. And the Netherlands, lacking national forest resources of its own, but equipped with a powerful fleet, for a long time needed to import valuable hardwood from the German, Slavic and Scandinavian lands. Teak plantations were therefore a necessary long-term option to guarantee a permanent supply and quality of the material, after the naturally regenerating teak forests in Java had been subjected to rapid deforestation. The losses of teak forests in Java were registered at 40 percent between 1776 and 1840 and about 30 percent between 1840 and 1870 (Boomgaard 1992: 12). According to the forest survey carried out in 1776, in 256 forest units of central Java, the majority of the districts reported reforestation activities, with direct sowing of seeds and limited silvicultural practices. The preferred method, however, was regeneration of teak forests by closing instead of reforestation (Ibidem: 8-9). Dutch teak experiments in Indonesia can be considered as the first strategic forest plantation by colonial powers. The

British Navy followed the trend after 1840, switching from oak to teak in shipbuilding and launching similar plantations in India (Ball *et al.* 1999).

In the late 19<sup>th</sup> century, teak plantations were so popular that they started to change from strategic to commercial purposes. First regular large-scale forest plantations in Indonesia started in Java in the second half of the 19<sup>th</sup> century (Ball *et al.* 1999: 1, ITTO 2009: 95). Teak was then also needed for railway sleepers and further construction. Between 1837 and 1842, 375 000 trees were averagely planted per year; and between 1856 and 1865 the number increased to 1 – 2 million (Boomgard 1992: 11). In 1897 such practices were institutionalized with specific decrees regulating forest management, and forest services, and a Forest Office was created to implement and execute the new rules (The Forest Service 1957: 45). The forestry management elites in the Dutch East Indies or British India were brought in from Germany (Peluso and Poffenberger 1989: 334, Boomgard 1992: 11, Bryant 1996).

Scientific forestry and silviculture together with the centralized institutionalization of forestry governance and the top-down goals defined for the plantations (firstly strategic, later commercial) mirrored the European approach but completely overlooked the local realities. Large tracts of land were removed from public access and classified as state forests, fixed boundaries between forest land were established and police forces controlled access to specific lands and species (Peluso 1991: 73). Timber plantations constituted a new symbol of power and wealth, a concentration of land and resources, attractive for both state and private actors. But as plantations, especially in the initial period, require labor, teak from the 1870s onwards was planted on Java in the “taungya” (*tumpang sari* in Javanese) system allowing the farmers to tend the plantation while intercropping it before the canopy closure (The Forest Service 1957: 10). However, taungya attracted only the worst-off farmers and guaranteed them only temporary access for land cultivation and forced them to live in temporary conditions and resettle with the new teak plantations, creating a class which Peluso calls a “forest-dependent proletariat” (1991: 71).

Paradigm	INDUSTRIAL COLONIAL	INDUSTRIAL NATIONAL	NEOLIBERAL	INDUSTRIAL NATIONAL / NEOLIBERAL - MODIFIED	SOCIAL	GLOBAL POLITICAL
Location	Mainly Java, trials in Sumatra	Mainly Java	Sumatra, Kalimantan	Nationwide	Nationwide	Nationwide
Time	1650s – 1940s	1961 – today	1970s – today	1980s – today	From 1970s, with bigger political support from 2006	Reducing pressure: post-Rio Carbon sink: post-Kyoto
Actors	Dutch East India Company, Dutch controlled Forest Office	State Forest Companies Perhutani	e.g. APP, APRIL	State and private companies, local communities	Individual farmers, Communities, NGOs	State agencies, international donors, NGOs
Species	Teak, limited Pine	Teak, limited Pine, Mahogany, Agathis, Sonokeling, Sengon	Acacia, Pine, Eucalyptus	Commissioned trees for companies	Multi – purpose trees	Varied
Land status	Land ownership of the colonial state, exclusive use introduced	Land ownership by the state	Land lease from the state	Land ownership by farmer, community with agreement with state/private company	Land ownership by farmer, community, or state	Flexible
Management	Monoculture plantation and Taungya	Monoculture plantation and Taungya	Monoculture plantation	Small scale monoculture, agroforestry	Agroforestry	Flexible
Finance	State for profit, stocks of Dutch East India Company	State for profit	Private for profit, foreign investments, capital ventures	Through partnership agreements and out-grower schemes	Microfinance	Flexible
Products	Logs for shipbuilding and construction, railway, furniture.	Logs, later value added: plywood, furniture etc.	Pulp, paper, pallets	Logs for companies for further processing	Timber for construction, for local industries, fuelwood, NTFPs	Ecosystem services, CERs
Justification	Quality and quantity of resource for strategic and later commercial purposes	Commercial product for national growth – for state's income and export surplus	Resource and profit (mostly profit not at the plantation level)	To balance inequalities in land and resources and address conflicts between the local populations and companies operating in their neighborhood	Cash crop, saving account, NTFPs – for local needs	Reducing pressure on natural forests, Carbon sequestration

**Table 4.4** – Emerging paradigms in Indonesian timber plantations in comparison  
(Source: own elaboration)

In this first paradigm of modern timber plantations the key actors in teak plantation undertakings emerged– state, private enterprises and the forestry service. The initial teak plantations were tested by the Dutch East India Company (VOC), a hybrid corporation under Dutch sovereignty (with monopoly in the period 1745 - 1808). From 1808 onwards, with

Governor Herman Willem Daendel's reforms, a system of forest management by the state was started, leading to some conflicts between the state and private companies (Peluso 1991: 67, Boomgaard 1992: 10). Since 1897, the government's central role was assured with the effective forest service acting on its behalf (Perum Perhutani 2012a, 2012b).

Reforestation efforts were a key element of Dutch forestry activities. During the Japanese occupation of Java between 1942 and 1945, reforestation was eliminated and replaced by agricultural production priorities (Peluso and Poffenberger 1989: 334). However, in the first decade following independence, the production of timber from plantations was actually lower than during the late colonial years (Booth 1998: 51). After the war, the authorities of the newly independent Indonesian state continued the Dutch forest policy and moved timber plantations back onto the agenda, a decision that is discussed in the next section on the national plantation paradigm.

Although teak was definitely the dominant species under the colonial paradigm, with further commercialization of timber plantations, softwood species also started to be planted: for example pine plantations in Sumatra launched in 1916 (FAO 2012). At the end of the period of plantation development under the industrial colonial paradigm, Indonesia was the world leader in timber plantation area, possessing 75% of the total plantation area in the tropical countries, reaching 500 000 ha (Lanly 1982 in: FAO 2012).

#### *National Paradigm (from 1961, modified in 2001)*

With Indonesia's independence and institutional transition, forestry rights and authorities were relegated to the Indonesian counterparts. The Forestry Office (*Jawatan Kehutanan*) of the Dutch Indies was transformed to the Forestry Office of the Republic of Indonesia. The decision of the newly independent state regarding both natural forest concessions and plantations was to make forest industry a branch generating much income for the state, but the policy was slowly implemented due to the political climate and struggles until the fall of the Soekarno regime (Peluso and Poffenberger 1989: 334). In 1961 the Forestry Office was replaced by State Forest Companies (*Perhutani*) which merged as one centralized company called Perum Perhutani in 1972 (Perum Perhutani 2012). Outside Java the Directorate of Reforestation and Greening (DITSI) was responsible for reforestation of state forest lands (FAO 2012).

Despite the power shift at the national level, the approach to plantations did not undergo any fundamental changes. While elite actors had changed, the land regulations, management system and species used or plantation products remained the same. So did the governance “spirit”. As Peluso notes “the German notion that centralized state forest control was most efficient and effective continued to pervade Indonesian forest policy long after the Dutch left” (1991: 73).

Plantations remained the symbol of power and patronage. The industrial national paradigm stressed the role of plantations in bringing the “national” revenue, adding to the “national growth” and “national development”. From the perspective of national economy plantations played the role envisaged for them in boosting the timber trade sector (still, however, dominated by the deforestation of natural forests). Timber became the country’s second largest source of foreign exchange – after oil. By early 1970s Indonesia was the world’s leading hardwood exporter, outracing the Philippines (Ross 2001: 157). But apart from the addition of the national component, the understandings of development remained the same. That comes as no surprise as “the colonial powers have been replaced with new land-owning elite, nearly all of whom were educated in Western-oriented schools and who shared the same concepts of ‘development’ through industrialization, as their teachers” (Dauvergne 1994: 506). However, in practice the shift gave power to the previous low level land managers to take control over the sector (Peluso and Poffenberger 1989: 335). And the revenues, especially under the Soeharto regime, were particularly benefiting the military elites and the ruling family.

In many tropical countries governments played a leading role in establishing the plantation industry, supporting research, organizing its own plantations, or subsidizing the private sector. However with the establishment of a critical mass of timber plantations, state actors usually left plantations to the private sector. In Indonesia this was only partly the case (and will be discussed in the neoliberal paradigm section), and the state company still remains one of the leading actors in plantation forestry.

However in the last decade the national paradigm has undergone large modifications. After Indonesia’s democratization and in the face of increasing conflicts on the state plantation land and initial violent responses from Perum Perhutani towards the local populations, in 2001 the company started a scheme for forest management with the community (PHBM: Pengelolaan Hutan Bersama Masyarakat). It is aimed at benefit sharing between the company and the local people. Now the previously inaccessible lands are subjected to intercropping contracts, people



collect dead branches of trees for fuelwood and more locals find employment in the company. Additionally, some management fees are paid to the local organizations and can be invested in village training, infrastructure etc. The PHBM scheme is already applied in 5165 villages with 5 million households involved, and constitutes a significant shift in plantation management and role<sup>20</sup>. Plantation Case Study 6 presented in the 5.2.2 will discuss in detail the relation of Perum Perhutani with local populations.

### *Neoliberal Paradigm (From 1970s, modified from 1980s)*

In the 1970s one could observe a reorientation of the plantation development based on market liberalization and emergence of foreign corporate actors in the Indonesian plantation sector (in ventures with the national capital). With the emergence of large pulp and paper industry players, plantations were perceived as the necessary option to feed the future resource needs. In 1973 the Indonesian Pulp and Paper Association presented a program of pulp and paper industrial development in the country (FAO 1975). As the FAO consultant sent to Indonesia to assess the plantation establishment for pulp and paper industry wrote: “No more time must be lost to start big industrial pulpwood afforestation program (...) Sumatra and Kalimantan should be given high priority in the proposed big-scale pulpwood plantation program” (FAO 1975: 3). Since then, Indonesia became the world’s main plywood exporter (62%) and producer (40% - replacing Japan) and “hopes to win this same rank for pulp exports” (Smouts 2003: 108 and 118).

The emergence of the new industry sector brought powerful private actors, vertically integrating pulp and paper production processes from plantation establishment and maintenance, transport, processing and marketing of the final product. In 1972 the structures of Asia Pulp and Paper (APP) emerged. Together with Asia Pacific Resources International Holdings (APRIL), both ventures control over 75% of total pulp capacity and are both linked to Chinese capital. The industry builds on 1.5 million hectares of plantations, dominated by Acacia species (Barr 2007)<sup>21</sup>. Indonesian government regulated that pulp mills should source the wood from plantations. However, due to the insufficient plantation supply compared to the mills’ capacity, government regulations have been postponed already several times (ITTO 2009: 53). The development of mills and pulp production capacities was “far swifter than that of the plantations”, and in 2000 the latter only supplied 8% of the fiber. “The remainder came from clear cuts in the natural forest, many of which were performed illegally” (Smouts 2003: 119).

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<sup>20</sup> Expert interview, 1.06.2012, Perum Perhutani.

<sup>21</sup> Acacia plantations managed by the company MHP will be discussed as a case study in 5.2.3.

The government's Industrial Timber Plantation plan (HTI) was initiated in 1983 to increase the amount of industrial timber plantations. It foresaw the allocation of 4.7 million hectares of land (FAO 2001: 8). Companies were offered loans, low land taxes and rights to clear and sell remnant vegetation from the concession areas. For HTI Pulp it approved 3 128 443 hectares but only 997 213 hectares have been planted. For HTI non-pulp the realization was much higher with 835 334 hectares approved, and 812 399 hectares planted (Kartodihardjo and Supriono 2000: 2). Enforcement of plantation targets failed due to the fact that many private companies have abused the incentives for timber plantation investment, harvested the natural forest, used the subsidies provided by the Reforestation Fund<sup>22</sup> but did not replant the concession area (Kartodihardjo and Supriono 2000: 9). The Ministry of Forestry plans to add 5 million hectares to HTI by 2016, a target unlikely to be achieved (MoF 2009 in: Verchot *et al.* 2010: 4). The current situation with industrial overcapacities and insufficient plantation establishment creates long-term deficits with rising social, economic and environmental pressure (Pirard and Irland 2007: 1057, Brockhaus *et al.* 2012: 34). Apart from some above-average performing corporate actors, Indonesian plantations under this paradigm did not reduce pressure from natural forests.

### ***Social Paradigm (From 1970s, with bigger political support from 2006)***

Conflicts and social injustice have assisted timber plantations from the very beginning of colonial plantation trials. In the colonial period, most of the plantation problems could be associated with heavy labor conditions, exploitation and exclusion of people from the plantation land. Already in 1880 forest police was employed to safeguard valuable timber (Peluso 1991: 71). Absurdly, local people, accustomed to the teak trees growing around them and working on plantations, could hardly afford such timber.

“The forest police entered village houses without advance notice, looking for standing wood (wood already used in construction) and concealed pieces (wood used in door frames, roofing ribs, boards, and posts) that had been "clandestinely obtained." A forest guard could use the smell of teakwood - particularly aromatic when freshly cut- as evidence of punishable theft. Frequently, houses standing two or three years or longer were demolished, the inhabitants punished, and the wood confiscated. Not surprisingly the villagers hated the police and considered their searches malicious” (Peluso 1991: 73).

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<sup>22</sup> The Reforestation Fund obliged companies to deposit a fee for each cubic meter extracted from the forest, with the assumption that the amount could be reclaimed after reforestation. In the 1980s the reforestation deposit was 4USD per cubic meter, increased to 7 USD in 1989 and 10 USD in 1990 (Otsamo 2001: 16). The mechanism has not been an effective tool, as replanting was generally more expensive than the refund and many business actors preferred to pay the deposit and not replant their concession sites (Dauvergne 1994: 514). Additionally in 2006 the half-brother of the ex-president Soeharto was convicted for fraudulent usage of loans from the fund (Barr 2007).

After Indonesian independence came, plantation regulations did not address the arising conflicts, trying to maintain the colonial top-down governance pattern maximizing financial benefits for national development. But with the population increase and further depletion of natural resources, the conflicts became more severe. The state company faced disputes because of several factors: land tenure and access rights, misbehavior of field foresters, failure to address ecological and socio-economic effects (Peluso and Poffenberger 1989: 337).

Partnerships of the companies with local populations are a first step to address the failures. In case of the state company Perum Perhutani, in 1973 a first community development program was initiated. However it was more a rhetorical shift than a change on the ground (Siswamartana 1998). Although pilot projects were held, their expansion never took place, and “pilot programs fell short of their stated objectives” (Peluso and Poffenberger 1989: 335). What is more, the forest management agency “had a limited capacity and will to plan or implement community-based programs. State forestry corporation managers refused to relax the traditional controls they had held over the lands, species, and the rhetoric of development” (Ibidem).

From the 1980s onwards, social forestry management systems became popularized under the state company’s auspices, involving land rehabilitation and promotion of agroforestry (see: plantation Case Study 6 discussed in Chapter 5). Forest Village Community Development (*Pembangunan Masyarakat Desa Hutan – PMDH*) was initiated by Perum Perhutani already in 1992 as a result of a multi-stakeholder decision by the local community, NGOs, local government and the state company (Mayers and Vermeulen 2002). However, only in 2001 did Perum Perhutani develop a popular joint management scheme known as PHBM and already mentioned in the previous section. An important part of the project are forest plantations, as rehabilitation of degraded lands through reforestation or planting of multi- purpose trees to assure the benefits of the local communities. According to the World Agroforestry Center the program became widely implemented and showed some initial potentially promising results (WAC 2010).

The trend towards partnerships is also visible in the operations of privately-owned companies, whose role in Indonesia’s timber plantation establishment will be discussed in the next section. Private HTI companies were obliged to involve communities in forest plantations (although without specification what management and benefit sharing should look like; see: Guizol and Aruan 2004) and were additionally encouraged by the government’s program called Farm

Forestry Credit Schemes initiated in 1997, which allocated community credits via the company partner (Nawir *et al.* 2003: 5). Another government initiative to combine timber plantations with social programs was HTI-Trans to support transmigrant labor. However, especially partnerships between private companies and smallholders are often accused of being another form of land rent and companies' access to new financial schemes (called "land lease" in: Race and Desmond 2001 and widely referred in the national expert interviews).

Apart from the partnerships of different actors with the local communities in tree planting activities, examples for the pure social paradigm involve grass roots initiatives in tree planting. Such smallholder plantations can be found in different parts of Indonesia. Millions of farmers in Java grow teak in home gardens or establish small individual and community plantations with sengon (*Albizia falcataria*, *Paraserianthes falcataria*) and mahogany (*Swietenia*). Sengon community plantation in Kalimendong will be further discussed and analyzed in 5.2.1. Discussing that traditional form of tree planting, Guizol and Aruan (2004: 108) note that "farm forestry and agroforestry provide, though often unrecorded, wood supplies for domestic consumption and raw materials to small- and medium-scale enterprises". Trees are grown in various agroforestry systems, often for economic reasons, but also for subsistence, environmental, aesthetic and cultural reasons (Kallio *et al.* 2011: 192). The scale of the phenomenon is not well reported, but according to the 2003 census smallholders produced 80 million teak trees (ACIAR 2005: 1). According to a national expert, smallholder timber plantations in Indonesia reach 3.5 million hectares but are widely dispersed and have irregular cutting cycles<sup>23</sup>. Timber plantations for smallholders play a role of saving accounts – household assets that can be used for special future needs, such as the education of children (ACIAR 2005: 5). Apart from species grown for timber, other trees for fodder are lamtoro (*Leucaena glauca*), glirisida (*Gliricidia sepium*) in Java and kadam (*Anthocephalus cadamba*) or Acacia species outside of Java (Rohadi *et al.* 2010: 4).

A significant shift for the empowerment of the social paradigm in Indonesia's timber plantations is represented by the "People Plantation" program (HTR) launched by the government in 2006. It foresees the establishment of 5 million hectares of timber plantations in the community system by 2016. Even with that unrealistic goal and weaknesses in the design

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<sup>23</sup> Expert interview, 28.05.12, FORDA.

and implementation (Obidzinski and Dermawan 2010), it marks a significant shift and empowerment of the social paradigm in the national policy-making.

Social paradigm in timber plantations is a promising approach to address the externalities of large scale state and private plantations with their narrow goals. However it has its own challenges, such as silviculture management, land ownership, land use competition, or market access. It is difficult to estimate the scope of plantations established under the social paradigm in Indonesia’s plantations. But the data from the implementation of the HTR scheme show a very slow establishment rate. By mid-2010 the Ministry of Forestry approved permits for only 40 681 hectares, far from 5 million hectare goal by 2016 (Ministry of Forestry 2010 in: Obidzinski and Dermawan 2010: 340).

<b>Time</b>	<b>Relevant developments of Indonesia’s timber plantations</b>
1650	Small scale timber plantations reported to be carried out by the Dutch colonial powers in Indonesia
1745-1808	Dutch East India Company organizes initial teak plantations in Java
1808	Daendel’s reforms – beginning of state control over forest management and exploitation
1880s	Teak plantations on larger scale in Java, Taungya system introduced
1897	Institutionalization of forest management assuring government’s central role
1916	Pine plantation trails started in Sumatra
1942-1945	Japanese occupation eliminates reforestation for agricultural production
1950	500 000 hectares of timber plantations reported in Indonesia, constituting 75% of timber plantation areas in the tropics
1961	Establishment of state forest companies (Perhutani)
1969-1974	First 5- year Development Plan includes reforestation
1972	Emergence of APP structures
1973	Indonesian Pulp and Paper Association presents a program of pulp and paper industrial development
1973	First Community Development Program by Perum Perhutani
1980	Reforestation Fund
1983	HTI
1984-1989	Fourth 5-year Development Plan supports large scale industrial short rotation pulp and timber plantations
1992	HTI – Trans: plantations combined with employment for trans-migrants
2001	PHBM scheme of Managing Forest with the Community by Perum Perhutani
2006	HTR
2009	President Susilo Bambang Yudhoyono made a commitment for Indonesia to reduce emissions by 26%, timber plantations as part of the national strategy

**Table 4.5** – Milestones in Indonesian timber plantation development (Source: own elaboration)

***Global political/ environmental paradigm (20<sup>th</sup> century with changing concepts)***

Environmental role of tree plantations has not been a stable intellectual construct. At the beginning of the 20<sup>th</sup> century one could observe spreading plantations for protective reasons (soil and water protection, combating erosion). Such programs as “Regreening” or afforestation

of non-forest lands were conducted mainly for protective purposes jointly by the Ministry of Forestry and the Directorate of Soil Conservation but were criticized for poor implementation and low survival rates, only 6% after nine years (Guizol and Aruan 2004). It is difficult to estimate the area of protective tree plantations in Indonesia, in the country's reporting to the FAO global planted forest thematic study no protective plantations as such have been recorded. However, Indonesia communicated 36.4 million hectares of semi-natural forest, meaning one that was assisted in natural regeneration or planted (FAO 2006) and protective plantations are included in this category.

In the post-1992 context, following the World Summit in Rio de Janeiro, plantations' environmental role has been defined as a means of reducing pressure on the natural forest. This was particularly true for Indonesia, where large pulp and paper mills were originally fed with natural forest wood. Plantations' role was therefore to indirectly protect natural rainforests by producing renewable raw material. It was understood that "intensive plantations with demonstrated potential for high productivity could replace natural forests as providers of forest goods, especially commodity-grade wood for pulp and construction material" (Paquette and Messier 2010: 28). According to Sedjo "by 2050 most industrial wood could come from a small area of plantation forests, much of it in subtropical and tropical developing countries, while natural forests could remain for environmental and other non-wood services" (2001: 24).

Most recently, after the shift brought by the 1997 Kyoto Protocol, a new environmental role attached to tree plantations could be observed, namely their capacity as "carbon sinks". "Another role envisioned for plantations worldwide is in combating global warming. Under the Kyoto Protocol, afforestation can be used to sequester [carbon], but the potential of plantations to relieve pressure on natural forests could also soon be credited as 'avoided deforestation'" (Paquette and Messier 2010: 29). Indonesia's president Susilo Bambang Yudhoyono made a commitment for Indonesia to reduce emissions by 26% against the business as usual scenario by 2020. Increases in industrial forestry plantations, smallholder forestry plantations, the "One Billion Trees" planting campaign, and the forest rehabilitation program are seen as relatively easy means to reach the targets as compared to stopping conversion of natural forests, peat lands or reducing illegal logging and combating fires (Lang 2011). However, as Verchot and colleagues show, the tree planting approach is unlikely to bring Indonesia to meet its emissions reductions targets (Verchot *et al.* 2010).

## **Chapter 5 – Plantations from a Local Perspective: Case Studies of Selected Plantations from Paraguay and Indonesia**

The previous chapter presented the inductively derived typology of plantation paradigms – knowledge structures organizing plantation practices according to certain interpretations of the economic, social and environmental goals that planted forests are to perform. The historical political economy of forestry and plantations in Indonesia and Paraguay was then presented, showing the evolution of these paradigms in both countries, and the way forest policy was organized accordingly. This chapter moves to the micro level, taking individual plantations as units of analysis. In the iterative process of this research, paradigms that were previously delimited are applied to the study of plantation cases. Before the comparative assessment of the plantation cases, a descriptive characteristics of each case is presented here, where history of each plantation and its main features, management issues and final plantation products and market chains are described. Subchapter 5.1 discusses the case studies from Paraguay, subchapter 5.2 case studies from Indonesia while the concluding subchapter 5.3 presents results from the comparative MCA analysis between the seven investigated plantations. Specific information regarding the MCA technique is provided in the Annex to Chapter 5.

### **5.1 PLANTATION CASE STUDIES IN PARAGUAY**

#### **5.1.1 Case study I: Smallholder plantation with development aid, San Pedro Department**

The PMRN - *Proyecto de Manejo Sostenible de Recursos Naturales* (Project for Sustainable Management of Natural Resources) of the German Development Agency (GTZ/ GIZ) and the German Reconstruction Credit Institute (*Kreditanstalt für Wiederaufbau – KfW*), supported by the Paraguayan Ministry of Agriculture and Livestock, started in the year 2000 under the motto for the sustainable management of natural resources in the poor regions of Eastern Paraguay (in 7 departments: Concepción, San Pedro, Canindeyú, Caaguazú, Guairá, Paraguari and Caazapá). It channelled resources, technology and know-how through participatory rural development

methods with field extension workers (Borsy *et al.* 2011). The total project period was ten years (October 2000 – October 2010) with the budget of 3.3 million euro for technical cooperation (Sylla 2010). One of the interventions has been reforestation with both exotic and native species. This part of the project and field activities started in 2003 and continued until the project's end. It is estimated that during the work with small producers, about 2676 hectares were originally planned and 2087 hectares have been effectively reforested (PMRN 2009:13). PMRN also promoted sustainable management of natural forest (with total real coverage of 2758 hectares) and agroforestry systems. It is estimated that about 25% of producers initially planning to participate in the project withdrew from its activities. About 9000 farmers participated in the project's forestry activities, including 5500 participating in reforestation (PMRN 2011). The beneficiaries of the PMRN received the coverage of initial plantation costs, plants and trainings. The interventions have been planned accordingly to the owner's objectives and his/her land availability. Therefore different species have been planted, with an estimated rate of 70% exotics (including 50% *Eucalyptus* genera) and 30% native species. It included exotics as *Eucalyptus grandis*, *Eucalyptus camaldulensis*, *Melia azedarach* and natives *Cordia trichotoma*, *Tabebuia impetiginosa*, *Cedrela fissilis* among others (PMRN 2011:108).

The project has been implemented by using the local committees of producers – established by local farmers group to receive technical assistance in small groups. Each producer could apply with 3 hectares of land to be covered with the project's forestry measures.

### ***Management and silvicultural practices***

PMRN supported establishments of local nurseries, 88 entities have been created in total with the capacity to provide between 5000 and 20 000 seedlings per year. Some committees after establishing their reforestation plans kept the nurseries to sell the seedlings to other producers, organizations and municipalities.

The project package included preparation of the soil, planting, management, pest control, thinning and pruning regimes. One of the favourite species used for reforestation was *Eucalyptus grandis*. The project's documents have foreseen its management in a 12 year rotation with two thinnings: at 4 and 6 years (both removing 30% of the standing volume). Pruning was especially recommended for *Eucalyptus*, Pine, Teak and Paraiso until the height of 8 meters to obtain high quality wood.



Initial plantation spacing depended on the species and farmers' individual priorities with 2x2, 3x2, 3x3, 4x2, 4x3, 3,5x3,5, 4x4 meters variations and a total amount of plants per hectare ranging between 625 and 2500. It has been estimated that the production potential of fast-growing plantations in the project is about 20m<sup>3</sup>ha<sup>-1</sup>year<sup>-1</sup>. But due to the variety of species used and individual management capacities, it is difficult to estimate the precise particular growth rates.

The project's documents point to the important constraints that could be also observed on sites – local management deficit and lack of farmers' motivation to realize thinning and pruning. Especially thinning is widely seen as production loss. Such management deficit can lead to frustration in the future, when the plantations economic value will fall below the projections.

### ***Final products***

PMRN plantations have been established mainly for timber production and fuel wood, and some additional own use by the producers (construction etc.), often with an assumption that the wood will be sold on the local and national markets.

The owners are free to decide when and where to sell the plantation products. Generally they tend to sell the wood too early; with the diameters between 15 and 25 centimetres without waiting until the optimal diameter and better price (final dbh recommended by the project is 40-45 cm, cf. Grulke 2005). From one hectare of an exotic plantation, the owner can earn USD 155 per year.<sup>24</sup> But as was already mentioned, after 12 years a well-managed plantation, subjected to thinning and pruning would produce wood worth much more (about double the price) than the same plantation without appropriate silvicultural management.

### **5.1.2 Case study II: Smallholder plantation with Clean Development Mechanism (CDM), Paraguari Department**

This project is a result of longer development aid provided by the Japan International Research Center for Agricultural Sciences (JIRCAS) in low income communities in the Paraguari Department, one of the poorest in Southern Paraguay. Together with the Paraguayan National Forestry Institute (INFONA) a small scale A/R CDM has been designed and implemented in the field from 2007 (Matsubara 2009, 2010). JIRCAS has been the leading party responsible for

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<sup>24</sup> With an average wood price estimated at PYG 35000/m<sup>3</sup>, productivity of 20m<sup>3</sup>ha<sup>-1</sup>year<sup>-1</sup> and exchange ratio USD 1 to PYG 4500.

project management while INFONA offered some technical and forestry support. Farmers provide land and labor and are the owners of the trees with the right to income from the plantation products (with some restrictions to time of cutting resulting from the project agreements). JIRCAS and INFONA finance the project, provide technical skills and know-how and the planting material and are entitled to the income from Certified Emission Reductions (CERs) resulting from the project activities. It was estimated that the plantation will sequester about 30 000 tons of CO<sub>2</sub> in the crediting period of 20 years.

The project area is located within two districts San Roque González de Santa Cruz and Acahay in the Paraguari Department. The official total planted surface is 215.2 hectares; nevertheless the actual project area significantly decreased under 200 hectares.<sup>25</sup> The project involved initially about 300 farmers, whereas 160-180 were willing to establish their plantation plots. After 5 years about 140 farmers remain, some of them cut the trees to establish home gardens, some experienced family conflicts over land or even changed the plantation to non-productive land.

After expert surveys and local consultations two variations of Eucalyptus (*Eucalyptus grandis* and *Eucalyptus camaldulensis*) and Silver oak (*Grevillea robusta*) were selected as suitable and locally desired tree species.

### ***Management and silvicultural practices***

The seeds for the plantations are provided by INFONA, the Argentinian National Institute for Agricultural Technology and the Paraguayan company *Emprendimientos Forestales SRL*. Organic matter has been used while growing seedlings in the nursery consisting of a mixture of cow dung and palm fruit husks. The nursery was located outside the project boundary, so fertilizers have not been used directly in the reforested parcels.

After the preparation in the nursery the seedlings have been directly planted without any machinery use. Plantation maintenance activities (weeding, thinning, pruning, harvesting) are to be conducted manually by respective farmers and their families. For Eucalyptus two thinnings are foreseen at the age of 4 and 8 years (40% and 30% of the standing volume respectively) and the final harvest can be done after 12 years. Grevillea plantations are to be

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<sup>25</sup> Expert interview, 13.02.2012

thinned after 10 and 15 years (40% and 30% of the standing volume respectively) with the final harvest occurring after 20 years.

JIRCAS promotes green manure application in the agricultural land and the increased soil fertility is expected to compensate for the partial agricultural land conversion to forestland. Also agroforestry system is promoted in the project with crops such as corn, cassava, manioc, cotton and beans. The species selected for the project are characterized by fast grow, pest and drought resistance. It is estimated that MAI for Eucalyptus can reach 20m<sup>3</sup>/ha/year and for Grevillea about 10 m<sup>3</sup>/ha/year.

### ***Final products***

The project lasts for twenty years (from 25 July 2007 to 24 July 2027) when the final harvest of Grevillea trees will be permitted. Final Eucalyptus harvest can be started after 12 years. However after 4 and 8 years the Eucalyptus thinning products and after 10 and 15 years Grevillea thinning products can be locally used and/or commercialized. Plantations will provide local fuelwood supply and later lumber for housing, posts and local construction purposes but also for sale and profit generation. Average Eucalyptus plantation of 1 hectare will give a mean income of 167 USD per year<sup>26</sup>. Properly managed plantations for timber can produce wood valued multiple of the amount. Eucalyptus plantations can additionally coppice and be used for next rotations. Projections for Grevillea are that the wood price may reach 200 000 PYG/m<sup>3</sup> but wood increment is slower, rotations longer and management more demanding.

### **5.1.3 Case study III: Out-grower schemes in Itapúa Department**

In the year 2000 the cooperative *Colonias Unidas* located in Itapúa in South-Eastern Paraguay started its internal plantations out-grower scheme contracts for energy purposes (biomass for energy generation). The contracts are signed between the cooperative and land owners for planting Eucalyptus as a 7 year rotation. With a high firewood demand in the cooperative (central office, branch offices, a slaughterhouse, dairy and fodder and yerba mate production) about 25 thousand tons of firewood are needed each year. With the designed reforestation program the cooperative aims at covering its energy needs by wood supplied from plantations.

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<sup>26</sup> Based on a wood price from the field surveys which is PYG 37500/m<sup>3</sup>, with a predicted productivity of 20m<sup>3</sup>ha<sup>-1</sup>year<sup>-1</sup> and with the exchange ratio USD 1 to PYG 4500.

Therefore a special program and a credit line have been designed to make reforestation an attractive production choice, especially favoured for remote and marginal lands.

The cooperative gives the necessary interest-free credit for plants and other necessary services (cleaning, insect control etc.). In return each producer needs to sell certain amount of fuelwood to the cooperative to pay back the credit obtained. The rest (which is usually three times as much from a hectare) the owner may sell on the market price for the cooperative or look for a different buyer. After slightly more than 10 years from the project's start, it is estimated that about 100 hectares have been planted annually because of the outgrower schemes contracts. Altogether the cooperative's members possess approximately 3000ha of forest plantations (Agrositio 2011). About 250 cooperative associates work with reforestation. Species used in the project are *Eucalyptus grandis*, *Eucalyptus camaldulensis*, *Eucalyptus urograndis* (hybrid) coming from seeds and clonal propagation. Seeds are imported from Brazil.

### ***Management and silvicultural practices***

The cooperative gives technical assistance for the plantation preparation and maintenance until the final harvest. Due to the scale obtained at the cooperative level, plantation work is more mechanized than in similar smallholder plantation projects. The landowner can select between 3 management systems: pure fuelwood plantation, plantation for fuelwood and timber and plantation in a silvipastoral system. Plantations established for fuelwood are planted with a 3x2 meters density with 1666 trees per hectare. Fertilization, replanting, pest and insect control and other technical assistance are provided by the cooperative technicians. Plantations that also aim to produce solid timber are planted with 4x2,5 meter density, 1000 trees per hectare and receive more silvicultural treatments. The silvopastoral system is planted with 8x2m spacing with 625 trees per hectare. It has been estimated that the MAI for fuelwood in a 7-year-rotation is about 30m<sup>3</sup>/ha/year.

### ***Final products***

The project proves that forest plantations may be successfully organized at the local level and they can be an attractive option both for the industry and landholders. One hectare of Eucalyptus plantation in the area produces between 180 to 200 000 kg of fuelwood after 7 years. 33 000 kg after the final cut need to be paid to repay the credit from the cooperative for plantation establishment and management. The prices are fixed in the contracts (115-140 Gs/kg depending on the year). The rest (fuelwood or timber – depending on the system the producer selected)

can be sold to the cooperative or on the external markets. It is estimated that the annual income from 1 hectare of Eucalyptus plantation within this conditions and exchange rate of USD 1 to PYG 4500 brings a net benefit between 536 and 742 USD annually. In the future the cooperative plans to add value to the plantation wood, for example there is one planned project for establishing a treatment plant for wood impregnation and another to invest in a chipper machine for chip production (compare: Mayeregger 2010).

#### **5.1.4 Case study IV: Enterprise POMERA, Alto Parana Department**

The Paraguayan plantation company belonging to the Argentinian group Pomera Maderas is also functioning under its local Paraguayan brand Desarrollos Madereros S. A. The plantation was originally established in the 1990s by the Shell group and taken over by Pomera in 2001-2004. Shell claimed to withdraw from forestry activities in South America but there also exist voices that it lost the interest after cancelation of subsidy laws.

The company possesses 21 100 ha of land in Paraguay while the plantation area equals about 7000 ha. Paraguayan Pomera is expanding with 1000 hectares planted per year, although the growth capacity could be even 3000 hectares annually. The reason for limited growth is legal insecurity perceived by the company. The rest of the company's land is natural forest, conservation areas, infrastructure and agricultural land (Kiriluk 2012). The company plants mainly Eucalyptus (*E. grandis* and clones *E. grandis* x *urophylla*), but some Pinus and native species have been planted as well. It possesses two locations, the first district is Tapyta in the Department of Caazapá and the second is Hernandarias in the Department Alto Parana.

The company provides 500 workplaces, mostly indirectly in the outsourced companies. The core management consists of 23 workers (mostly from Paraguay, 3 from Argentina). The operational part of the work is coordinated by four additional enterprises. Despite the outsourcing practices, it assures high work and safety standards by providing their own staff and subcontractors and their families with social security benefits and the workers with work safety equipment and access to training programs.

Pomera cooperates with a national NGO *Moises Bertoni* and donated 4700 hectares of its land with 3500 of the natural Atlantic Forest of Alto Parana to the foundation. Cooperation with the NGO helps the company to address the social issues related to the managed land

(relations with local farmers and indigenous people, access rights and liberties). On the other hand *Moises Bertoni* manages the donated land as a bio-corridor for the fragmented remains of the Atlantic Forest.

### ***Management and silvicultural practices***

The Paraguayan Pomera has its own independent Research and Development department. It deals with the technology invention and monitoring for the plantation management, especially the selection and studies on superior tree individuals, but also controls of physical and mechanic wood characteristics.<sup>27</sup>

The seeds are obtained from seed orchards in South Africa, Zimbabwe and Florida. The company runs its own nursery with a small cloning garden for vegetative reproduction, a vegetation hall, pre- and rustification areas (POMERA 2011). Plantations are established after the terrain preparation and ant control measures, rigorous pest control and fertilization are implemented. Pruning is applied to all the standing trees at the age of 10 months. Later on, the best trees are selected for further pruning. There are two thinnings leaving ultimately between 180 and 200 trees per hectare.

Pests are monitored and controlled, specially the leaf-cutting ants (*Atta spp.* and *Acromymex spp*) and recently a new Eucalyptus pest - the bronze bug (*Thaumastocoris peregrines*). The agrochemicals applied by the company are not classified as IA and IB by WHO and no chlorinated hydrocarbons are used. Pesticides used are not classified as highly persistent, highly toxic or biologically active derivatives and do not accumulate themselves in the food chain. The purchase, use and storage of chemicals are strictly regulated.

The annual cutting regime depends on the annual sale projection. Rotation time varies between 12 and 14 years and the MAI reaches even 40m<sup>3</sup>/ha/year. The company applies fire protection measures with reduction of combustible materials , firebreaks, observation towers, water tanks and detection systems.

### ***Final products***

The final products can be divided into several groups (as for 2011):

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<sup>27</sup> Expert interview, 27.02.2012

- Plywood and sawtimber (52% of the overall production)
- Fuelwood (44%) and woodchips (2%) - from the first and partly from the second thinning
- Posts (2%)

Based on the length and diameter parameters the company sells wood in five categories. It has more than 40 permanent clients in Paraguay, including smaller and bigger local businesses processing the wood. In the value added chain there exist about 3000 jobs<sup>28</sup>. The main sale is for the local market and the local industries sell the final product both at the local market and abroad. Pomera exports directly only poles to Bolivia for electrification. Prices of wood depend on the category and range between 19 and 65 USD for cubic meter (see: Table 5.1).

Product category	Price
Fuelwood	19 USD/m <sup>3</sup>
Roundwood	
Category 1	44 USD/m <sup>3</sup>
Category 2	39 USD/m <sup>3</sup>
Category 3	34 USD/m <sup>3</sup>
Category 4	29 USD/m <sup>3</sup>
Poles	65 USD /m <sup>3</sup>

**Table 5.1** – Price categories for wood sold by POMERA 1USD=4500Gs  
(Source: expert interview, 5.04.2012)

## 5.2 PLANTATION CASE STUDIES IN INDONESIA

### 5.2.1 Case study V: Community plantation through Community Forest Owners Association APHR, Wonosobo Regency, Java

Sengon trees (*Albizia falcataria*, *Paraserianthes falcataria*) have been planted in the Leksono Wonosobo District for generations for construction purposes and for households' own use. Five forest villages in the area have been active in promoting farmers' sustainable forest management: Kalimendong, Jonggolsari, Manggis, Durensawit and Kepil. From the establishment of farmers' groups in 1978 various trials have been conducted to select the most beneficial agroforestry system. From the 1990s the snake fruit (*Salacca zalacca*, locally salak) - sengon combination proved most suitable and sengon trees started to be planted on a commercial basis. Farmers' cooperation became institutionalized with the establishment of the Community Forest Owners Association of Wonosobo (Asosiasi Pemilik Hutan Rakyat APHR) in 2001 (APHR 2012). The communities, actively involved in the association, jointly managed

<sup>28</sup> Expert interview, 27.02.2012

to implement innovative projects, as the recent certification of the origin of wood (*Sistem verifikasi legalitas kayu SVLK*), a joint success of the Association and the NGO Arupa. Sengon trees are selectively cut based on the farmer's individual needs and play a role of a local "saving account". The daily income is generated from all year round collected snake fruit. Additionally some farmers plant coconut, banana and durian trees, keep livestock, establish fish ponds etc.

The village of Kalimendong has been selected for analysis due to its special role in the project, the APHR secretariat is located in the village, a charismatic village head of Kalimendong is a key figure in the local plantation sector development and the local community possesses a relatively large area (427ha) of lands that are managed in the plantation agroforestry system (Muryanto 2012). Kalimendong has 1500 inhabitants and the reported plantation area consists of 30 000 sengon trees and 330 000 salak trees (Village statistics 2012).

### ***Management and silvicultural practices***

*Paraserianthes falcataria* is referred to as the „miracle tree” by the local population due to its very fast growth rates and as it is one of the most significant pioneer multipurpose tree species in Indonesia (Krisnawati *et al.* 2011). The trees are raised by stump cuttings practiced by the trained community members. The actual silvicultural practices depend on the land owners' individual goals and decisions. In the sengon/ salak agroforestry system spacing of trees is usually wide with a hectare composed by 100 sengon and 1000 salak trees. Weeding and fertilizing is applied, with the use of herbicides and fungicides.

Local farmers and loggers elaborated a unique harvesting system to cut the sengon trees without damaging the alley intercropped snake fruit trees. Cutting is done selectively, depending on the owner's financial needs.

Stem canker, a fungal disease has been recorded in the recent year in most of the plantations. Improving soil fertility and more farm diversification are common measures applied by the farmers to deal with the problem.

There is a local fire unit but fire is not a problem in the area, APHR area lies at an altitude of 600 - 800 meters above sea level, with rainfall between 2400 - 2500 mm. MAI accounts for about 25m<sup>3</sup>/ha/year but the rotation depends on the farmer and usually varies between 3-15 years. In good quality sites even a MAI of 40m<sup>3</sup>/ha/year can be achieved.



### ***Final products***

Sengon timber is used for a range of purposes, such as construction, furniture, source of veneer and plywood, pulp, paper and other. However, the sengon trees in the community are generally sold to the logger and the value chain can be described as follows: farmer-logger-collector I- collector II- industry – local/national/export markets.

One of the biggest economic constrains is that many farmers are forced to sell the wood with a small diameter when they need fast income. The price for such a diameter is very low, only a dozen USD. And it rapidly increases with the diameter reaching 75USD/m<sup>3</sup> for 12-15 year-old trees. The village leader is opting for a forest bank to help people with loans and prevent cuttings of young trees (Muryanto 2012).

### **5.2.2 Case study VI: State enterprise Perum Perhutani, Randublatung Regency, Java**

Perum Perhutani operations are coordinated by the Ministry of State Enterprises (BUMN) with technical guidance from the Ministry of Forestry. The company manages forest area of 2 442 101 ha, including 1 750 860 ha of production forest (PP 2012b). It is divided into three units, further divided into forest management units (known as KPH).

The case study research was conducted in KPH Randublatung known for big areas of teak plantations. It manages 31 870 hectares of land with about 10% left for conservation and biodiversity purposes, where enrichment planting with native species takes place. 28 081 hectares are teak plantations of the KPH.

Total area of the KPH is managed under the Community Based Forest Management (PHBM) scheme and creates 455 work places. Experiencing serious social conflicts and wood losses, the company came with a new approach for involvement of the local populations. Overall in Java, the PHBM scheme is already applied in 5165 villages with 5 million households involved, and constitutes a significant shift in plantation governance.<sup>29</sup>

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<sup>29</sup> Expert interview 1.06.2012

How the plantations are managed in practice and what is their role for the local communities was examined on the example of the village of Tanggel involved in the scheme from 2003. Tanggel lies in the proximity of vast plantation areas, and has representative background characteristics (LMDH unknown), most of the inhabitants are farmers and also the “pesanggem” phenomenon of landless farmers is common. The size of the management unit that includes Tanggel is 2850 hectares.

The KPH Randublatung is certified with FSC Chain of Custody and undergoes the Indonesian SVLK certification.

### ***Management and silvicultural practices***

Perum Perhutani is divided into the Units, KPH and management units but it possesses a centralized Forest Resource Management and Planning Department.

The company uses both generative and vegetative propagation. Direct seeding is applied in teak plantations at spacing 3x1m. As the purpose is establishing high value trees both in volume and quality, many activities are applied in the plantation lifespan and include: weeding, pruning, thinning, protection against pests and diseases, but also against grazing and fires.

Harvesting in a clear-cutting system is labor intensive, with employment of the local people. A standard rotation time is 60 years. In 2002 plantations of the company's own clone JPP (Jati Plus Perhutani) have been introduced and are supposed to have only a 20-year rotation cycle. MAI is estimated to be between 4 and 8 m<sup>3</sup>/ha/year for long rotations and is expected to double with Perhutani superior teak.

### ***Final products***

Due to the very high prices of teak a wood registration system has been created. It monitors the wood from stumps in the field until they reach the end user. Plans are prepared by the company's centralized Directory of Industry and Marketing and Directory of Finances. Teak planted on Perum Perhutani land is sold to the Indonesian industry and processed for exportation. Teak industry is well developed in Central and East Java with sawmills, veneer plants, parquet plants, furniture processing etc. However the value added in the case of the studied area has not been created locally but at the national level (in the city of Jepara known for teak furniture manufacture, located 200 kilometres from the site).

### **5.2.3 Case study VII: Enterprise Musi Hutan Persada (MHP), Muara Enim Regency, Sumatra**

PT Musi Hutan Persada is a joint venture company between the state-owned Inhutani V (40%) and the Japanese Marubeni Corporation (60%). According to the decree of the Minister of Forestry from 1996, PT Musi Hutan Persada (MHP) was granted a license for industrial plantation management in South Sumatra on the concession land covering 296 400 hectares. 193 500 hectares of land (65%) are planted and intensively managed, 27% of the concession is managed as a conserved area, and the rest of land is used as a buffer zone, for infrastructure, and local and multi-purpose tree species plantations (MHP Booklet). The concession was given in 1990 for 43 years by the Ministry of Forestry with an extension possibility.

The company supplies a local pulp mill and 95% of the plantation is forested with *Acacia mangium*. MHP possesses also trial plots with *Eucalyptus pelita*, *Acacia crasicarpa* and hybrids.

It employs 20 000 people (13 000 permanent jobs and 7000 seasonal). 68 villages are located in the concession area, a fact that creates constant tensions (Awang *et al.* 2005, Levang and Sitorus 2006, Purnomo *et al.* 2009).

The company shows engagement in social activities. Especially after the 1998 and the chaos after the falling regime, it experienced big-scale land encroachment and started to work with the NGOs, universities, village leaders to look for new ideas how to collaborate. It developed two programmes of cooperation with farmers in and outside of the concession area. Known as MHR (People Forest Management) and MHBM (Community Based Forest Management) they allow the local communities either to work in an “out-grower scheme contract” or to get direct and indirect benefits from company operation.

The plantation is certified with FSC and LEI (Lembaga Ekolabel Indonesia). It has its internal policy on controlled wood where it commits itself to avoid illegally harvested wood, wood harvested in violation with traditional and civic rights, wood harvested from forests with high conservation value, conversion of natural forest to plantations, and wood from genetically modified trees.

### ***Management and silvicultural practices***

The company is divided into areas (50-60 000) and each area has its production and plantation division. The plantation divisions are additionally divided into units (6000-13 000ha), that consist of blocks (2000-3000 ha), which are further divided into sub-blocks (400-800ha). The Research and Development department has three divisions responsible for Silviculture, Tree Improvement and Pest and Disease. All the departments collaborate with each other and with other divisions of the company. Additional cooperation with Indonesian and foreign universities and research institutes takes place, including LIPI (Indonesian Institute of Science), Kyoto University (Japan), University of Gajah Mada (Indonesia), University Bengkulu (Indonesia), CIFOR (Center for International Forestry Research), ACIAR (Australian Centre for International Agricultural Research), CSIRO (Commonwealth Scientific and Industrial Research Organisation, Australia), Research Institute for Sustainable Humanosphere (Japan) and the Forestry and Forest Products Research Institute (Japan).

Operating the plantation includes nursery, land preparation, planting and fertilizing, maintenance, fire protection, pest and disease protection and final harvesting. As the plantation product is wood for pulp, there is no thinning or pruning. Nursery is the separate department under the plantation division and includes sowing and maintenance of seedlings for 3 months. In the early plantings seeds have been collected from selected stands in the concession area and some seeds have been imported from Australia and Papua New Guinea to broaden the genetic base. Now the company became self-sufficient with its own seed supply from selected trees.

After 3 months the seedlings are manually planted with 1111 /1333 trees per hectare (with spacing 3x3m or 3x2,5m depending on soil conditions). In the dry season aqua soft is used for seedlings' water supply, phosphorus fertilizer is applied upon planting. Plantation maintenance includes one manual weeding and 2-3 chemical weedings. The survival rate is around 97% and replanting to 100% takes place. Plantation rotation is fixed at 6 years. After 6 years the trees possess a 15-18cm diameter and height of 20-25 meters. Felling is a combination with manual and mechanic roles (chain saw). The felling crew clear cuts the plantation and fells the trees in the same direction and cuts them into the length of 2,5 meters. Extraction is done using a forwarder, loading uses an excavator loader and later on the transportation to the mill is carried out. The residuals and trees with diameters less than 5cm are left on sites. The processing mill is located directly on the plantation area.

One of the main problems for the plantations are the long-tail monkeys eating the sweet Acacia bark. Therefore trial plots with new species are tested and considered for the future.

A very important plantation activity is fire prevention and control due to significant fire threats in the area. Fire breaks are constructed around the compartments; fire towers are used for smoke detection. Different fire brigades are formed and trainings/simulations are provided to the employees and communities in the concession area.

MAI depends on the site characteristics and ranges between 15 and 30 m<sup>3</sup>/ha/year, with areas classified for low (15-20 MAI), medium (20-25 MAI) and high (25-30 MAI) production potential.

### ***Final products***

Since 1999 the company entered an agreement regarding the harvest and supply of timber with the pulp mill PT Tanjung Enim Lestari Pulp and Paper. According to the agreement 100% of the plantation product is sold to PT TEL in the period of 20 years. The product is woodchips for the power plant and pulp for export to Japan (later the pulp is processed for paper). Previously the company used to be more diversified in terms of products, with some of the plantations with longer rotation rates for furniture and sawn timber. The long-term mill agreement means secure market (the mill has even a bigger capacity than the MHP plantations can supply) but also less flexibility for the company. The 3% price increase guaranteed annually by the mill is below the inflation rate and sometimes additional negotiations take place. Price for Acacia wood ranges between 27-30USD per m<sup>3</sup>.<sup>30</sup> The production target is 1 500 000 m<sup>3</sup>/year equaling 2 200 000 tons/ year delivered to the PT TEL.

## **5.3 MULTI-CRITERIA-ANALYSIS OF THE PLANTATION CASE STUDIES**

The MCA analysis of the selected plantation case studies enables a profound comparison of selected plantations. The steps for MCA with the data normalization procedures for comparability, creation of clusters of indicators and elaboration of final synthetic indices that are illustrated below are explained in the Annex to Chapter 6.

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<sup>30</sup> Expert interview, 21.07.2012, 1USD = 10 000 IRP

In the remainder of this chapter, the most interesting results will be discussed. A further analysis of the plantation performance, this time through the prism of paradigm fit (convergence of the theoretical assumption with empirical observations) will be discussed in detail in Chapter 6.

- The results (figures 5.1 and 5.2) show that the best maximal performance in all fields (social, economic and environmental) can be attributed to the *case study III on smallholder out-grower scheme plantations in the Itapúa department in Paraguay*. This case shows an extremely high social performance (90%) and a very high economic performance (84%) and an average environmental performance (56%). The reasons for the social strength of the out-grower scheme are assuring very high participation, access to services, adequate human resources management and adequate standards for safety on the plantation site. Its economic strengths are high and equally distributed benefits, very good market access, good profitability, and well developed financing mechanisms. Main economic challenges for this plantation were lacking value added chains and competing land uses (soybean cultivation). Environmental weaknesses are the monopoly of exotic species, habitat losses in the area, use of chemicals and poor soil practices. The national environmental standards are weak and no external environmental standards have been considered by the cooperative. This limited environmental awareness is however problematic all over the country.
- Interestingly the second best performance among the Paraguayan plantations reveals *case study IV of the enterprise POMERA in the Alto Parana department in Paraguay*. This plantation shows high social (82%) and economic (66%) performance and an average environmental performance (49%). The company possesses high work safety standards, advanced training programs for all staff members, good access to information considering the plantation and prevention conflict resolution mechanisms. It could better promote participation and consultation in land-use planning. Economically speaking the company assures very good market access but there are many factors that limit its benefits and profitability. Environmental problems related to the plantation is clonal propagation of exotic species, water impacts, habitat losses and use of chemicals due to the leaf-cutting ant problem on plantation sites.

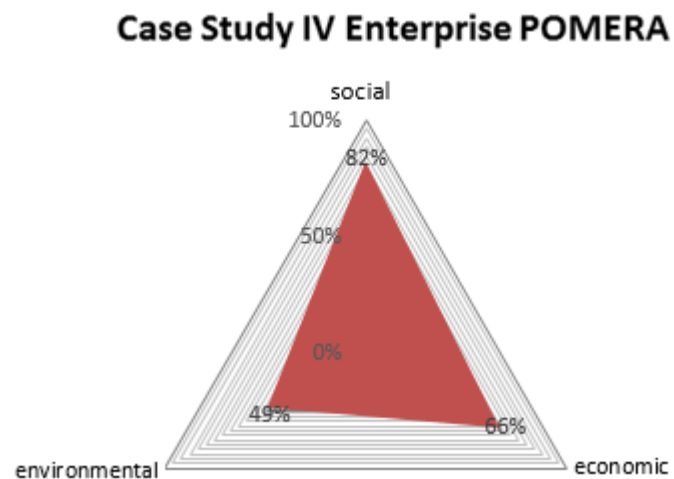
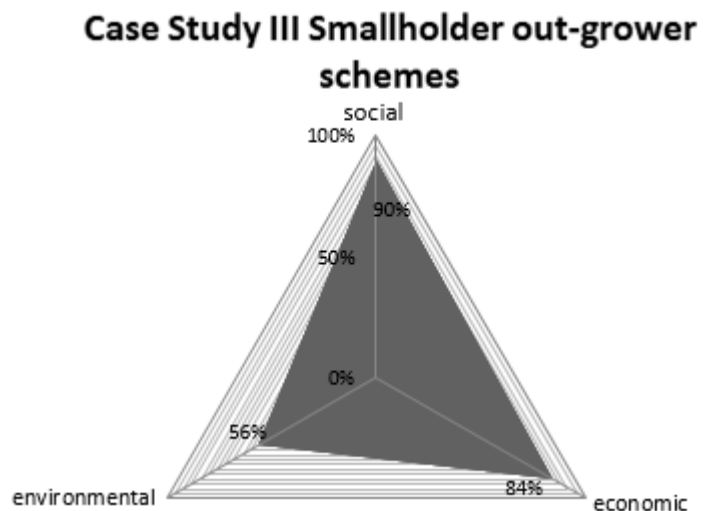
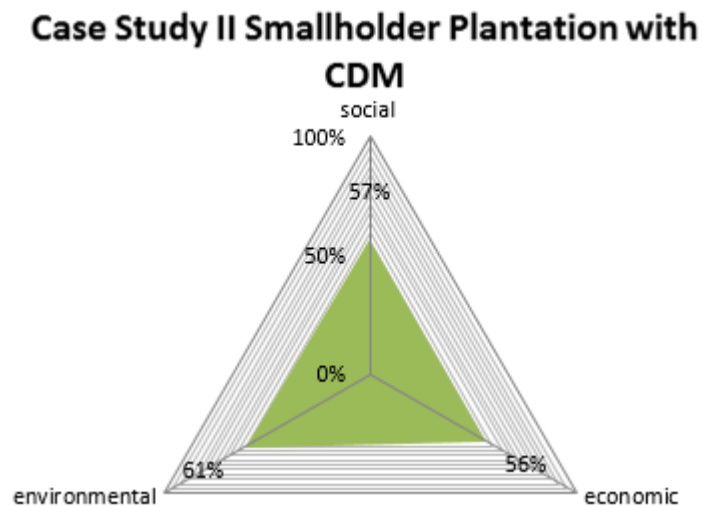
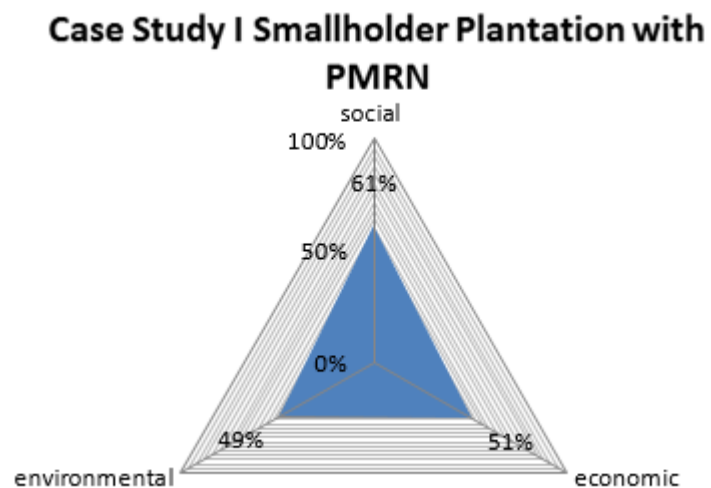
- *Case study I of the smallholder plantation with PMRN in the San Pedro department and case study II of the smallholder plantation with CDM in the Paraguari department in Paraguay* show both a similar and moderate performance in all the fields (61% and 57% for social factors respectively; 51% and 56% for economic and 49% and 61% for environmental). Good participation is confronted with low safety, poor access to many services and problems related to human resources (significant out-migration of youth from rural areas, weak mechanisms for conflict resolution etc.). Economically moderate profitability and weak access to markets or problems with the environment for investments constitute significant challenges for the smallholders managing tree plantations. The CDM plantation has a higher environmental performance due to promotion of green manure, ban on chemicals and commissioned environmental impact assessments and monitoring.
- The best performing plantation in Indonesia and second best in the analysis is *case study V on smallholder community plantation with APHR in the regency of Wonosobo in Central Java, Indonesia*. It shows an above average performance in all study fields (70% for social, 69% for economic and 69% for environmental). This plantation assures good participation, access to services and human resources policies with high profitability and market access, positive soil, water and land use practices. Its main challenges from the social part is work safety, from the economic – value added chains and from the environmental – pests attacking the trees.
- *Case study VII of the enterprise MHP in the regency of Muara Enim in South Sumatra in Indonesia* shows a balanced performance with good social practices in 69% of the analysed factors (especially training, work safety, information access) but with space for improvement in access to services or local involvement. The company scored 57% in economic factors, with a secure market access but other economic criteria are more problematic (benefit sharing, value added chains, competing land uses etc.). Environmentally the big size of monoculture plantation influences the habitats, shows vulnerability to pests and fires and requires heavy machinery. But with certification, rejection of cloning,

environmental monitoring and standards it manages still a moderate performance of 61%.

- *Case study VI of the enterprise Perum Perhutani studied in the regency of Blora Java in Indonesia* is among the weakest performing plantations. It faces significant economic problems, from local benefit sharing to international market competition, with sensitive environment for investments, to high investment costs and very long investment spans. All these factors sum up with the lowest economic performance of 48%. Also social factors scoring 61% point to very severe problems with human resources management, poor access to services and moderate participation scores. Environmental performance of 62% is lowered by the current clonal propagation, environmental threats on the plantation, use of chemicals etc. Due to long rotations this plantation, unlike others, is strong in supporting habitats for local animals and providing environmental services more similar to those in the natural forests.

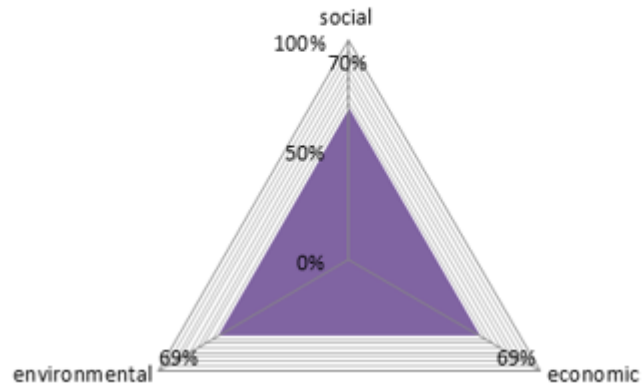
MCA results and a comparative analysis of the case studies bring important observations. The results will be discussed in the next Chapter 6 in relation to the paradigm concept and further analysed in Chapter 8 on lessons learned.



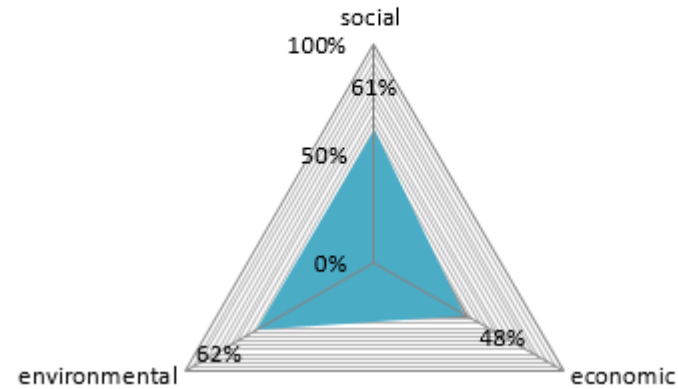


**Figures 5.1** - Socio-economic-environmental performance of plantation case studies in Paraguay (Source: own elaboration), detailed performance according to the specific indicator clusters are provided in the Annex to Chapter 6 in Figures 6.4 (A), 6.6 (A), 6.9 (A) and 6.11 (A)

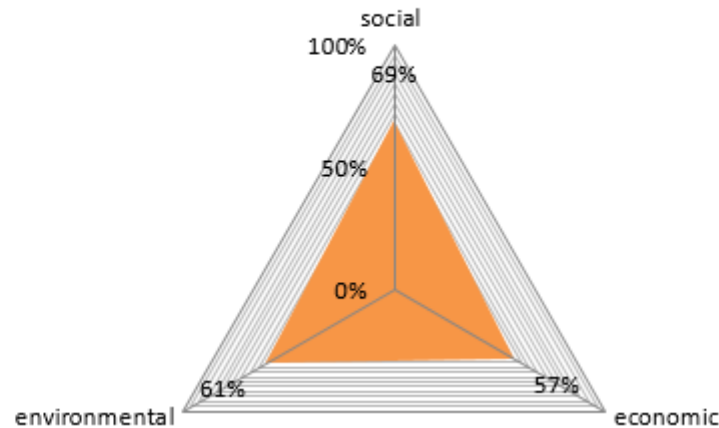
**Case Study V Smallholder Community  
Plantation APHR**



**Case Study VI State enterprise Perum  
Perhutani**



**Case Study VII Enterprise MHP**



**Figures 5.2** - Socio-economic-environmental performance of plantation case studies in Indonesia (Source: own elaboration), detailed performance according to the specific indicator clusters are provided in the Annex to Chapter 6 in Figures 6.13 (A), 6.15(A) and 6.17 (A)

## **Chapter 6 – Integration and Dynamics between the Global, National, and Local Levels**

This chapter aims at integrating the assumptions from the macro analysis (Chapter 4) with the actual evidence coming from the plantation case studies in Paraguay and Indonesia (Chapter 5). This is done in a discursive way but supported with a correlation analysis between the paradigms and their indicators (6.1). Each paradigm is comparatively evaluated based on 11 paradigm characteristic factors. Furthermore this chapter discusses the identified divergences (6.2) and points to the particular strengths and weaknesses of the identified and assessed paradigms (6.3).

### **6.1 COMPARATIVE ANALYSIS: GLOBAL PARADIGMS AND THE LOCAL PERFORMANCE OF SELECTED PLANTATIONS. ASSUMPTIONS VS. OBSERVATIONS**

Paradigm fit analysis is important for a meta-reflection on the concepts based on their performance on the ground. For the transparency of the analysis each paradigm is discussed separately and according to the same steps. Firstly a brief characteristic of each paradigm features is provided and plantation case/cases are assigned to the corresponding concepts. Later on the plantations' features are discussed according to the paradigm indicators that were listed in categories in the Figure 2.2 and analyzed in Table 4.1. As different paradigms are supposed to put different emphasis on social, economic and environmental issues, their overall performance in these fields was also taken into account. The comparative analysis is therefore based on the following factors:

- historical context of the plantation
- land issues (including land tenure)
- decision-making and participation
- provision of benefits
- governance characteristics
- knowledge and expertise status
- capital sources for plantation
- growth rates
- overall social performance
- overall economic performance
- overall environmental performance

Each paradigm discussion sums up with a short comment, where paradigms' features are divided into three groups: convergent observations (confirmed assumptions), partly divergent observations and divergent observations. Later the divergent observations are discussed in detail (6.2) and in the concluding paragraph (6.3) reflects on the strengths and weaknesses of given paradigms.

### **6.1.1 Industrial national paradigm reflected in Case study VI (Perum Perhutani in Randublatung, Indonesia)**

#### *Brief paradigm characteristics*

As explained in detail in 4.3, the *industrial national paradigm* in plantations can be observed with the demise of the colonial period, from the end of the XIX century, but most commonly in the decolonization process of 1950s and 1960s. The significant power change at the international/national level did not translate to big reconceptualization of plantation forestry activities on the ground. Structurally, the newly established states replaced the colonial authorities but did not question land, governance or management issues. For many governments the plantation sector has been portrayed as important for economic growth and development. Therefore in the *industrial national paradigm* the newly independent states and central forestry authorities are to play the leading role. Very often subsidies were introduced for the planting sector's expansion. The expected benefits were to add to the national growth and secure export revenues.

In Paraguay there is no on-going plantation that could serve as an example of the industrial national paradigm. Generally, timber plantations in Latin America have been privatized. On the contrary, in Indonesia the state forestry company remains one of the biggest plantation actors and controls substantial plantation areas until now. The performance of the industrial national paradigm can only be studied where governments kept their own plantation industry.

Therefore for the illustration of the industrial national paradigm a case study from Indonesia has been selected. It is *Case study VI: State enterprise Perum Perhutani from Regency Randublatung in Indonesia*.

#### ***Historical context***

The historical context of the studied plantation, as expected, has its roots in the colonial era. Shortly after the Indonesian independence, the Forestry Office of the Republic of Indonesia has been established and took over the Dutch teak plantations. From the beginning its role in the national economy has been stressed. Due to political instability, it took years to create adequate forestry laws and State Forestry Companies (Perhutani). But once it took place, state companies are one of the key plantation actors in Indonesia, especially managing large teak estates in Java. Older plantation

plots in Randublatung have been planted in the 1930s by the colonial powers and have been later overtaken by the state company with the goal to increase the national revenues.

### ***Land issues***

State control over plantations in Indonesia lead to big land accumulation. Perum Perhutani manages a forest area of 2 442 101 hectares, with 1 750 860 of production forest dominated by teak plantations. Much of its land has been directly taken from the Dutch managed plantations. It creates conflicts with the local people, especially in the overpopulated island of Java. Before, land conflicts with the powerful state actor were hardly suppressed, with violence occurring on plantation land. Nowadays, still severe conflict exists (in Randublatung there is an entire class of landless farmers as the plantations took a substantial land area) but there are common programs for benefit sharing with the local communities and some limited opportunities for plantation alternative land use have been created.

### ***Decision-making and participation***

As the field research shows, on state managed plantation in Java, local involvement in decision making and membership in local organizations are very low, similarly to the neoliberal paradigm plantations. The score for local involvement from the local survey reached 29%, the second lowest result from all analyzed plantations (see: Annex to Ch. 6). Correlation analysis shows that the industrial national paradigm is the strongest negatively correlated with participation (Pearson correlation at  $-.612^{**}$ , compare Annex to Chapter 6).

### ***Provision of benefits***

Stakeholders in the plantation mostly refer to the national benefits that the tree planting activity is delivering, with market supply and export earnings listed in the first place. Subsequently stakeholders refer to the environmental services and development of national forestry science. The national importance of service delivering is therefore widely accepted and the dominant discourse. It is the only paradigm with a positive and significant correlation with national export (Pearson correlation at  $.204$ , compare Annex to Chapter 6).

### ***Governance characteristics***

The company's organization is very hierarchical, with headquarters in Jakarta and three main management units. Units are further divided into districts and sub-districts. Decision-making is a top down process, power and position of different stakeholders strongly manifested (e.g.

uniforms). Some participatory elements have been introduced with the Community Based Forest Management (PHBM) scheme. However, they are so far encouraged only in issues of lower importance and not related to issues of higher importance in plantation management.

### ***Knowledge and expertise status***

The company has the position and authority to produce knowledge and expertise regarding the plantation. However with decades of local experience in teak planting in the area, local knowledge is also considered as important and applied on the plantations. However, it is more informal, individual experience and not an official, purposeful incorporation of local knowledge.

### ***Capital sources***

Plantation capital is taken and returned to the company that operates under the Ministry of State Enterprises (BUMN) and with technical guidance from the Ministry of Forestry. Its revenue in 2010 was estimated at 184 million dollars with net profit of 14 million dollars (Hidayat 2011). There is a strong positive correlation of this case study with the state support and cooperation with national universities (Pearson correlation at .234\*\* and .312\*\*compare Annex to Chapter 6).

### ***Growth rates***

The plantation growth rates for teak are with a MAI between 4 and 8 m<sup>3</sup>/ha/year (for long, 70 years rotations). However the company possesses its own superior teak clone, that is predicted to double the growth rates.

### ***Social performance***

The plantation has quite weak performance in the analysed social indicators. As expected, especially access to services is very class dependent and for poor stakeholders significantly limited. Similarly human resources management issues show visible weaknesses.

### ***Economic performance***

Not fully in accordance with the initial assumptions is the economic performance of the plantation. Local interviews show weak benefit sharing. Also the benefits for the national economy are limited as the expert interviews reveal. Teak competition on the international market reduced the profits of the company. Unstable investments environment brings risks (conflicts, thefts and fires that affect the economic performance) and add to the decreased overall profitability of the analysed case study.

### ***Environmental performance***

Environmental performance of the state plantation has various positive and negative effects. With such long rotations, the plantations are playing important habitat functions. Also with the certification standards adopted, desired reference points have been introduced. However there are also significant environmental threats because of the plantation, such as natural threats (fires, pests), threats related to the management decisions, uniform plantation material and use of heavy equipment with poor road design.

After the brief discussion of local performance of the state plantation and its reference to the ideal-typical industrial national plantation, the following observations may be identified:

### **6.1.2 Social paradigm reflected in Case study I (PMRN in Paraguay) and Case study V (Community Forest Owners Association in Indonesia)**

#### *Brief paradigm characteristics*

The *Social paradigm* in plantations, discussed in detail in 4.3, has been presented as an approach that intensified from the 1970s. This new turn put emphasis on social issues – such as local services provided by trees and a more equitable and fair redistribution of wealth generated by the forestry sector. Therefore plantations started to be organized at the local level in the form of community and smallholder estates. Previously marginalized actors and their local goals became empowered (Ngamsomsuke and Saenchai 1987, FAO 1994). Also environmental concerns of industrial plantation development begun to be addressed here. The social paradigm in plantations brought participatory orientation in governance, reintroduced non-exclusive perspective on land ownership, which acknowledged the needs of various stakeholders and was closer to the concept of the planted forest as a common (FAO 1987). Use of marginal lands or combining various land uses as in agroforestry and silvopasture have been promoted. Tree planting activities became more receptive to traditional knowledge. And if outside technology transfer was involved (e.g. NGO or development aid-led plantations) technology transfer has been adapted to the local specificities.

Two plantations that have been already presented in Chapter 5 were selected with a working hypothesis to represent the social paradigm in tree planting. These are:

- i) *Case study I Smallholder plantation with development aid from PMRN project, San Pedro Department, Paraguay and*
- ii) *Case study V Community plantation through Community Forest Owners Association, Regency Wonosobo, Indonesia.*

### ***Historical context***

Firstly, in both Paraguay and Indonesia some emerging planting activities correspond to the global empowerment of the social paradigm in plantations. In Paraguay smallholder plantations were promoted since the 1980s by development aid and the analyzed case study,

the PMRN project, is also rooted in that experience. In Indonesia plantations with social paradigm features started slowly in the 1970s with pilot programs for community based plantations and this is also the time when planting activities started in the analyzed case study of Wonosobo.

### ***Land issues***

Both cases studied share distinguished land characteristics. Average size of the analysed smallholder plantation was 0.91 hectares for Paraguay and 0.69 hectares in Indonesia<sup>31</sup>. Plantations are not a subject of local land conflicts and very often offered a non-exclusive land use - 64% of the visited plantations in the PMRN project used agroforestry systems, 4% silvopasture while 100% of the Wonosobo plantations applied agroforestry (see: Annex to Chapter 6).

### ***Decision-making and participation***

Both plantations selected as examples of social paradigm in tree planting completely outrank the other case studies in terms of local involvement in decision making and membership in local organizations. The score measured for local involvement in decision-making was 88% for the Paraguayan<sup>32</sup> and 100% for the Indonesian case, while companies engaged in tree planting possess involvement scores at about 25% thresholds. The social paradigm is strongly positively correlated with local participation (Pearson correlation at .743\*\*, compare Annex to Chapter 6).

### ***Provision of benefits***

Plantations conducted under the social paradigm assure a diversified variety of local benefits. They provide the widest range of local products and services as income, environmental services, saving, employment, construction, value added and fuel wood. The particular distribution of local benefits depends on the local conditions (f.e. fuel function of wood is very important in Paraguay and not as important in Indonesia) but both cases show a diversified range of benefits that such plantations provide. Social paradigm, unlike other paradigms, positively correlates with local means of savings, (Pearson correlation at .217\*\*, compare Annex to Chapter 6).

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<sup>31</sup> With a significant difference between both countries: in Paraguay land parcels were several times bigger than the plantation sites, in Indonesia most plantations covered the entire land parcels and therefore intercropping and maximization of land use were necessary.

<sup>32</sup> A detailed analysis of participation and social capital in the PMRN plantation with a comparative analysis of two communities participating in the project was published by Szulecka and Secco (2014).



### ***Governance characteristics***

Both plantations also confirmed the bottom-up decision making processes within the social paradigm. Even when promoted by the external project (as PMRN in Paraguay) the owners were responsible for the final decisions while the extension agents, local association, committees of producers were providing guidelines and assistance.

### ***Knowledge and expertise status***

Both case studies can also be characterized as applying decentralized knowledge and expertise. However in Paraguay the stakeholders could identify only two sources of expertise: external project and local cooperative from the area, where the plantations were located. This may be explained by lack of traditional knowledge on tree planting in Paraguay and limited access to other sources of knowledge. In the Indonesian case farmers used more diversified knowledge sources as traditional knowledge, books, extension programs and trainings from the local association – closer to the characteristics of an ideal type social paradigm plantation. Social paradigm has strong positive correlation with diversified sources of knowledge: local knowledge, knowledge from cooperatives/ associations, knowledge from projects, knowledge from national institutions and knowledge from books (Pearson correlation at .495\*\*, .545\*\*, .216\*\*, .225\*\* and .182\* respectively, compare Annex to Chapter 6).

### ***Capital sources***

The Paraguayan and Indonesian case have different sources of funding, but both are considered typical for such social paradigm plantations. In Paraguay the plantation project started with external financial support but some farmers will continue tree planting on their own after the project expired; in Indonesia the initiative and funds came from the community itself.

### ***Growth rates***

As related to the plantation benefits and production potential, typical social paradigm plantations should show a lower performance compared to industrial plantations (due to scale issues, multiple uses etc.) This was true in the Paraguayan case, where experts judge the MAI scores from the PMRN plantations as medium (about 20 m<sup>3</sup>/ha/year for 7-12 years *Eucalyptus* rotations). However in Indonesia, due to long experience and advanced practices the plantation was close to industrial growth rates with scores over 25m<sup>3</sup>/ha/year for *Paraserianthes falcataria*.

### *Social performance*

The overall social performance was high in both cases, with high scores for participation (83% for Paraguay and 80% for Indonesia), human resources (63% and 88% respectively) and access to services (66% and 83%) but it was very limited in work safety and work standards (only 33% and 29%).

### *Economic performance*

Regarding the overall economic evaluation score, the social paradigm plantations were expected to have moderate scores but offer a good benefit distribution. So the benefits in both cases are relatively low (however as the initial costs are low and labor is provided on farm, plantations are still profitable), but equally redistributed. A significant economic constraint for both case studies is limited market access. The environment for investments was better on the plantation case from Indonesia (loan program, no competing land uses) and more limited in Paraguay (no access to microfinance and incentives for other land uses, especially soybean).

### *Environmental performance*

In terms of environmental evaluation score, social paradigm plantations were expected to score relatively high on environmental performance evaluation. In Paraguay the main obstacles were the lack of control or disposal for chemicals, soil erosion problems, and missing environmental reference points – such as executed national environmental laws or certification standards. In Indonesia the environmental problems were poor plantation material, environmental threats, habitat loss due to intensive agroforestry management, and limited control over chemicals.

## **6.1.3 Neoliberal paradigm reflected in Case study IV (POMERA in Paraguay) and Case study VII (MHP in Indonesia)**

### *Brief paradigm characteristics*

The *neoliberal paradigm* in plantations, profoundly discussed in 4.3, has been presented as an approach that intensified after a re-conceptualization of the economy according to neoliberal ideas from the end of 1970s and beginning of 1980s. This new turn in plantations put emphasis on growth, privatization and deregulation. Therefore plantations started to be organized as vital private financial investments. It brought land accumulation and exclusive land use, with financial profit maximization as the ultimate plantation goal. Trees in this paradigm are seen through a narrow lens as marketable goods. Plantations under the neoliberal paradigm take minimal account of social and environmental issues, obey the national laws and eventually increase the standards to gain additional markets or improve the investments stability. They draw from international scientific forestry developments. Under this paradigm, very high growth rates are being achieved.

Two plantations that have been already presented in this thesis were selected with a working hypothesis to represent the neoliberal paradigm in tree planting. They have been already discussed in Chapter 5 as:

- i) *Case study IV Enterprise POMERA, Alto Parana Department, Paraguay and*
- ii) *Case study VII Enterprise Musi Hutan Persada, Regency Muara Enim, Indonesia.*

### ***Historical context***

Firstly, in both Paraguay and Indonesia we can observe plantations created with the assumptions characteristic for the neoliberal paradigm. While in Indonesia such undertakings started from the 1970s with the pulp and paper industry, in Paraguay foreign capital flow in plantations started much later than in the other countries of the region, after the end of the dictatorship in 1989. Both plantations selected for analysis have been established in 1996 and prove that although the roots of the paradigm are some decades old, its actual representation intensifies in many countries as the plantation sector rapidly expands worldwide.

### ***Land issues***

In both studied plantations a significant land accumulation took place. The Paraguayan POMERA planted 7000 hectares of land with Eucalyptus and has a possibility to expand as it owns 21 000 hectares. The Indonesian Musi Hutan Persada leased even 193 500 hectares of land. Both companies base their activities on monoculture plantations, have exclusive land policies and experience some land-related conflicts. While in the case of POMERA, only 20% of interviewed stakeholders pointed to land-related conflicts, for MHP all interviewed stakeholders confirmed serious land conflict in the area, especially due to the not-nationally-acknowledged traditional *adat* rights.

### ***Decision-making and participation***

Both plantations selected as examples of the neoliberal paradigm in tree planting show a very low score for local involvement in decision making and membership in local organizations, at about 25% thresholds. Similarly to the industrial national paradigm, the neoliberal paradigm in plantations is negatively correlated with local participation (Pearson correlation at  $-.389^{**}$ , compare Annex to Chapter 6).

### ***Provision of benefits***

Neoliberal plantations are seen by their stakeholders as providing a limited range of benefits, with employment and direct cash income being the main local services. Other mentioned benefits are environmental services as stakeholders clearly link tree planting activities with improvements in the local ecosystems. In Indonesia, because of the size of the company local value added has been mentioned but it was referred to the local businesses supporting plantation operation and not any wood processing industries. Neoliberal paradigm is positively correlated only with one local benefit: employment generation (Pearson correlation at .643\*\*, compare Annex to Chapter 6).

### ***Governance characteristics***

Both plantations also confirmed the top-down decision making processes on plantations. Both represent hierarchical pyramid structures. However in Paraguay an interesting technique has been applied to assure information flow across levels – a system of ‘suggestion boxes’ provides important and anonymous feedback across the employment levels in the company. In Indonesia such feedback is limited by the hierarchy and information can only proceed from the principal workers to their local bosses, further unit leaders and eventually reaches the headquarters.

### ***Knowledge and expertise status***

Both companies are referred to as having a monopoly over centralized knowledge and expertise related to the plantation. Neither local knowledge, nor institutional cooperation with the national forestry agencies is used. Company’s knowledge and technology constitutes its crucial assets. The neoliberal paradigm is negatively correlated with all other sources of knowledge except of the company’s knowledge where it shows a strong significant correlation (Pearson correlation at .455\*\*, compare Annex to Chapter 6).

### ***Capital sources***

As would be expected for the neoliberal paradigm, the Paraguayan and Indonesian case companies have both foreign, external financing – Argentinian investors for POMERA and Japanese for MHP.

### ***Growth rates***

With the intensive industrial management and modern technology, both plantations show impressive MAI rates. For POMERA the MAI scores for *Eucalyptus grandis* and *E. grandis x urophylla* are 40 m<sup>3</sup>/ha/year (with a rotation of 12-14 years), for MHP the MAI of *Acacia mangium* is classified in three groups depending on location and soil properties, with high: 25-30 MAI, medium: 20-25 MAI, low: 15-20 MAI. Here the rotation is only 6 years.

### ***Social performance***

The performance of social indicators in the analysed plantations was not in accordance with the initial assumptions. The social performance score is clearly high in both cases, but in both plantations this overall number is high due to the plantations' advanced work safety. Compared to other types of plantations, work safety is characterized by strict rules, periodical trainings and their day-to-day implementation. This is not always the case in the neoliberal plantations. Both plantations increase participation scores by training programs and improvements in access to information. However strict participation in decision-making disaggregated from the cluster of indicators was low and has been already discussed.

### ***Economic performance***

Economic performance of plantations under the neoliberal paradigm was also slightly different than expected. Although both plantations are very well connected to the markets, both have problems with economic long-term stability due to general problems with the environment for investments (land conflict, competing land uses etc.). Profitability in the Indonesian MHP plantation is structurally constrained. This is due to the vertical integration of the pulp and paper industry – where high profitability is not assured at the plantation level. Plantation benefits range and local benefit sharing are also constrained for both case studies.

### ***Environmental performance***

Environmental performance of both plantations is quite limited, a fact that could be assumed from the paradigm characteristics. For both cases certification standards and soil measures are highly valued, but environmental threats and habitat loss are the common environmental problems. In Paraguay the plantation material is considered as problematic, along with the potentially damaging impact of *Eucalyptus* on water. In Indonesia such a large land use change (from different landscapes to monoculture plantation) is considered as environmentally undesired.

#### **6.1.4 Neoliberal modified paradigm reflected in Case study III (Out-grower scheme in Itapúa, Paraguay)**

##### *Brief paradigm characteristics*

The *neoliberal modified paradigm* in plantations has been identified and discussed in 4.3 as a response to serious conflicts resulting from the global proliferation of the neoliberal plantations, leading often to serious social and environmental conflicts. Especially land tenure and land use rights have been addressed in the modification, so is a more participatory approach to the decision making. An ideal realization of the neoliberal modified paradigm plantation is an outgrower scheme contract that brings together investors and local stakeholders. Such approaches have become popular since the 1990s in many countries. In some cases, the modification did not bring important change, served as another way to get companies monopoly over land and tree resources. In other cases, such plantations have been more successful in limiting local conflict, reintroducing local traditions and assuring long-term production and profits for both contracted sides. Plantations in this paradigm should therefore combine strong economic and social performance, be more responsive to the local particular needs and at the same time use the companies' coordination for production on bigger scale, good market and technology access.

Although in theory, the outgrower scheme plantations should be now widely represented across the globe, their identification in Paraguay and Indonesia has been more difficult. What has been referred to as outgrower schemes turned out often to be land rentals of big companies, where all plantation work and management has been executed by the company.<sup>33</sup> Therefore a case study of a plantation that established real shared responsibilities in form of the outgrower scheme contract is illustrated only on one example, which is: *Case study III Out-grower scheme in Itapúa, Paraguay*.

##### ***Historical context***

Firstly, the outgrower scheme model has been implemented by the cooperative *Colonias Unidas* since the year 2000 and has been a novel form for plantation organization in the country. The purpose of the outgrower scheme was assuring energy security of the cooperative's factories with wood coming from plantations.

##### ***Land issues***

All plantation land is owned by smallholders who dedicated parts of their parcels for tree growing. The actual plantation sizes ranged from 0.75 until even 250 hectares, depending on the owner's disposable land area. All plantations had clear land titles, clear land obligations resulting from written agreements and there were no land related conflicts. One farmer

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<sup>33</sup> Especially in giant companies such as APP or APRIL (expert interview 16.07.2012)

mentioned land related fears that were, however, the result of the national land reform and government policies, not related to the plantation land agreement with the cooperative.

### ***Decision-making and participation***

Local involvement in decision making and membership in local organizations are high, scoring 75% in the local survey, much higher than in plantations managed by the companies and a little bit lower compared to the social paradigm plantations. This shows that the framework for participation is in place and is effectively used by most of the farmers, while other contractors are not using it fully, and are passively awaiting directives.

### ***Provision of benefits***

The neoliberal modified paradigm plantation brings more local benefits compared to the pure neoliberal paradigm plantations discussed on the example of POMERA and MHP. Stakeholders listed income, local construction material and environmental services. However compared to more bottom-up plantation initiatives, the range of benefits is moderate. People are not that creative to add value on their own, they use the secure market of the cooperative even with the wood surpluses that could be potentially sold to different markets at better prices.

### ***Governance characteristics***

Plantation's governance is regulated in the contract as a resultant of the owner's individual priorities and obligations coming from the cooperation with the cooperative. The land owner decides where and how much to plant (can also apply agroforestry or silvopasture) and needs to provide a certain amount of wood to pay back the plantation and assistance costs. The surplus wood can also be sold to the cooperative, used on the farm or sold elsewhere. This type of contract specifies the minimum responsibilities of both parties, but guarantees both sides space for freedom. Also, new contracts are negotiated each year by the cooperative and farmers to adapt to the changing wood prices. Fair governance can also be the result of the fact that the cooperative officials and the farmers are actually members of the same communities; there are examples of people being farmers and cooperative members/workers at the same time. The size of the cooperative is big enough for the production scaling up and small enough for local people to possess a shared identity, sense of belonging and collective action.

### ***Knowledge and expertise status***

Although knowledge and expertise should have multiple sources accordingly to the outgrower scheme characteristics, here, on all of the plantations the cooperative was the only actor providing such technical knowledge (Pearson correlation at .358\*\*, compare Annex to Chapter 6). This may reflect the particular situation of Paraguay; where there is not much local plantation knowledge and also national universities/institutions are not efficient in extension or information services in the countryside.

### ***Capital sources***

Financial capital for the plantation costs is provided by the cooperative in the form of interest free loans that are repaid with wood. The cooperative gets a sufficient amount of wood and a permanent supply due to the contracts. Other assets (land, labour) are provided by the farmers. Also the wood surplus after repaying the loan is the financial profit of the land owner.

### ***Growth rates***

As expected the MAI on outgrower scheme plantations is quite high due to the cooperative's coordination and reached, on average, 30 m<sup>3</sup>/ha/year on a 7 year rotation for *Eucalyptus* species. Farmers are instructed and helped to maintain the plantations accordingly and their plantations are better cared for compared to farmers planting trees in social forestry projects. The neoliberal modified paradigm is positively correlated with big production potential (Pearson correlation at .294\*\*, compare Annex to Chapter 6).

### ***Social performance***

As was originally assumed, the outgrower scheme plantations have a very strong social performance and a very balanced one (positively and equally distributed among the analysed clusters of indicators). They score well in participation issues, access to services, human resources management and work safety. In the social issues they combine work safety with social strengths identified in the social paradigm (equal access to services, participation, and orientation towards human resources).

### ***Economic performance***

Economic performance of plantations under the neoliberal modified paradigm is also successful, both in absolute terms (good market and profitability) but also in economic redistribution of benefits and stability (stable and secure environment for investment).



### ***Environmental performance***

Environmental performance is visibly weaker compared to the social and economic counterparts. There are no voluntary standards (no interest in certification), no interest in native species, habitat functions etc. However the plantations often replace intensively managed agricultural land and are referred to as positive for the local water regime.

### **6.1.5 Global political paradigm reflected in Case study II (CDM in Paraguay)**

#### *Brief paradigm characteristics*

As explained in 4.3, the *global political* paradigm in plantations emerged from a general ideational shift towards globalization of environmental issues. This stresses the global role of plantations and includes many other potential disciplines and discourses that are important in shaping plantation forestry activities worldwide. From the globally empowered ideational constructs regarding plantations, especially the one involving climate change is high on the political agenda and has been implemented under the Clean Development Mechanism scheme for plantations. Globally empowered plantations are expected to be rather project-oriented, on the one hand flexibly adapting to the local conditions, on the other maintaining a limited temporal scope. High politicization is expected in association with such plantations. This should be visible in plantation actors and politicization of plantation issues. Land issues as many other factors should be rather project dependent. Plantation governance is attached to the fluid “global governance”. The understanding of global political paradigm plantations is clearly shifted from their local or national role to the global services that they should be providing.

Although the carbon plantations are very much empowered in the global discourse, there exists only a small number of possible plantation cases, where this plantation paradigm could be studied and assessed. The actual number of plantations that have already successfully undergone such validation is very low. Additionally only plantations with some track record could be selected for analysis, where trees have been planted already some years ago. For this reasons only one plantation from Paraguay has been able to fulfill the case selection criteria. In Indonesia, CDM projects are just starting and much more promoted REDD projects do not concentrate on tree-planting activities at their core. Under these circumstances, the case selected for analysis is: *Case study II Smallholder plantation with Clean Development Mechanism, Paraguari Department, Paraguay.*

#### ***Historical context***

Global environmental thought and particularly institutional solutions for global environmental governance can be traced back to the Rio Earth Summit of 1992. The conference can also be seen as a starting point for the Framework Convention on Climate Change. Further the Kyoto

Protocol from 1997 brought more specific emission reduction targets and acting strategies, including the CDM mechanism, promoting plantation establishment globally. The CDM plantation in Paraguay launched by the Japan International Research Center for Agricultural Sciences (JIRCAS) with the cooperation of the National Forestry Institute (INFONA) in 2003 can be seen as one of the pioneer projects that apply carbon methodologies towards tree planting and underwent the sophisticated validation procedures (Hallin 2010).

### ***Land issues***

Land issues in the project have been clearly adapted to the local scenarios. Participants dedicated only a part of their land for planting, between 0.5 and 2 hectares. The official total project area of 215.2 hectares decreased to less than 200 hectares as some plantations have been cut prematurely. As the project has been prepared and implemented in a participatory way, stakeholders did not identify any land related conflicts. Plantation land use is non-exclusive and adapted to the particular family needs (species, intercropping) and to the local situation (green manure planted in the understory to address local poor soil conditions).

### ***Decision-making and participation***

Local involvement in decision making and membership in organizations is moderate, scoring 50% in the local survey. It is significantly higher than on plantations managed by companies, but lower than in typical social forestry projects. This partly divergent observation can be explained internally because of the general weak local institutions and low social capital levels. It can be also explained externally as the project and its ambitious goals may be difficult to understand for farmers with low education.

### ***Provision of benefits***

The studied CDM plantation is a good example of balancing local and global benefits. Stakeholders point to many local benefits coming from planted trees – as increasing local fuelwood supply that is critical in the area at the moment, improving soil characteristics, providing local income, bringing options for investments (trees as saving accounts), providing wood for construction, offering possibilities for value added chains (beekeeping) and improving local environmental conditions. Also global benefits from the plantations are referred to as preventing global warming, providing oxygen, increasing global timber supply and generally improving the natural environmental conditions. However, in-depth interviews showed that

climate change knowledge is instrumental and limited and there is no local understanding of carbon storage services.

### ***Governance characteristics***

Governance in the project has been participatory oriented from the planning phase. Local hearings have been organized long before tree planting. While species selection, plantation size, areas, intercropping were negotiated locally or adapted to individual farmer's needs, the cutting regime is defined by the project (due to the carbon emission reduction calculations). Once entering the scheme, farmers are required to follow specific cutting obligations. For *Eucalyptus* it is set at min. 12 years, for *Grevillea* at min. 20 years (with some thinnings in between). Shortly after the project's establishment, some of the owners did not respect their obligations. Here compared to the outgrower scheme contract (where cutting time was of mutual interest), the CDM project is lacking implementation powers.

### ***Knowledge and expertise status***

Surprisingly, knowledge and expertise used for the plantation were externally brought by the project and no elements of local knowledge could be identified. However it must be admitted, that the project dedicated lots of resources to carefully apply external knowledge to the local peculiarities and needs. It shows the strongest correlation among other plantations to the cooperation with national and foreign universities (Pearson correlation at .545\*\* and .872\*\*, compare Annex to Chapter 6).

### ***Capital sources***

The CDM plantation has typical funding sources for such projects, coming from different project partners, including foreign actors. In this case it is the Japan International Research Center for Agricultural Sciences (JIRCAS) that is the main initiator and donor and it is locally supported with resources from the Paraguayan National Forestry Institute (INFONA). The carbon credits issued in the project will firstly go to JIRCAS and subsequently also to INFONA. Nevertheless they are completely detached from the tree owners and from the local level, a fact that limits the local understanding and may be responsible for cutting trees too early.

### ***Growth rates***

As expected, the growth rates on the CDM plantation are moderate, with MAI for *Eucalyptus* up to 20 m<sup>3</sup>/ha/year and for *Grevillea* up to 10 m<sup>3</sup>/ha/year MAI (rotation *Eucalyptus*: 12 years, *Grevillea*: 20 years). It is less than the industrial companies can achieve with similar plantations but still quite a good performance for plantations that are cared by various owners, on poor soils and that have various goals to fulfil.

### ***Social performance***

The CDM plantation shows a moderate performance in social indicators with the biggest shortcomings in work safety. In this field, similarly to the social paradigm plantations, work safety, safety equipment and standards are rather neglected.

### ***Economic performance***

As hypothesized, economic performance of this plantation is rather weak in absolute terms, but showing a positive benefit sharing and wealth redistribution among the actors. Market access and the general environment for investments add to constraining economic factors.

### ***Environmental performance***

The overall environmental performance can be seen as moderate and it is not much better than in the other studied plantations. There is a problem with poor plantation genetic material, with road design and maintenance, a general habitat loss in the area and lacking environmental standards (national are poorly implemented, certification standards have not been considered). However the project authorities carried out an EIA, there are no chemicals used on the plantation, people see positive water effects after planting trees and so far there are no environmental threats affecting the plantation sites.

## **6.2 EXPLAINING DIVERGENCES – ON THE UNPREDICTED OBSERVATIONS**

Most of the case studies come very closely to the paradigm characteristics and the paradigmatic approach can be attributed to have explanatory power regarding particular plantations features and performance. Nevertheless some characteristics proved to be stronger or weaker in terms

of their “implementation” at the local level. Here such distinctions will be made and the weaker and unpredicted observations will be contextualized and discussed.

### ***Industrial national paradigm***

After a comparative analysis of the state plantation and its reference to the ideal-typical industrial national plantation, the following observations may be identified:

#### *Convergent observations*

The plantation generally falls very close to the initial assumptions derived from the global analysis of the changing approaches to plantations. Historical context, land issues and conflicts, local involvement, plantation benefits, decision-making schemes, and financing mechanisms, growth rates, shortcomings in specific social and environmental performance clusters are generally all confirmed assumptions observed in the field.

#### *Slightly divergent observations*

A partly unexpected observation was the use of local knowledge mentioned by many stakeholders. It is not institutionalized or formally applied by the company, but due to the local plantation traditions lasting for generations and the fact that local people plant teak around their homes, they possess their own knowledge and understanding regarding management of teak.

#### *Divergent observations*

What was unexpected, were many economic problems that the state plantation is facing, especially market issues that are also problematic for such big plantation players (international competition), but also the risk-loaded environment for investment that limits the profitability.

The industrial national paradigm illustrated by the Indonesian state company had one partly unexpected observation – use of local knowledge smuggled by many stakeholders. This is however a result of a long term continuity of Teak plantations in the area and also farmers own interest to plant teak trees. Therefore this observation can be rather case specific and accidental, as there are no formal mechanisms for traditional knowledge incorporation in the company’s operation.

Another divergent factor was the relatively poor economic performance of the company. Especially market issues, that were supposed to be very favourable for such a big international player, were weaker than expected. It is the result of the current global market competition (international competition with Thailand, India or China), but also the problematic environment for investment (big population growth in the country adding to land related conflicts, decentralization policies creating strong regional elites, corruption, costs for new social programs for the communities, thefts on the plantations, fires) that limits the profitability.

### ***Social paradigm***

The social paradigm in plantations that has been discussed based on one community plantation in Indonesia and one development aid organized plantation program in Paraguay also proved to work well in attributing paradigm characteristics to the local situation.

#### *Convergent observations*

Both case studies fall close to the assumptions derived from the global analysis of the changing approaches to plantations and the social paradigm features. Historical context, land issues and local involvement, goals of the plantations, decision-making schemes, and financing mechanisms are all confirmed assumptions observed in the field in both countries. So are the strong overall social and moderate overall economic performances.

#### *Slightly divergent observations*

Some observations are partly confirmed and partly divergent; these are knowledge and expertise sources that were quite limited in the Paraguayan case, unexpectedly high plantation growth rates in Indonesia and visibly poor work safety measures in both countries.

#### *Divergent observations*

A common unexpected observation that will be further discussed in the next subchapter 6.2 is the poor environmental performance of both studied plantations.

Some partly unexpected observations were poor work safety on both plantations, limited sources of plantation knowledge in Paraguay and high growth rates for the Indonesian case. Poor work safety on both plantations resulted from access problems and limited local awareness of protection measures. Limited sources of plantation knowledge for Paraguay are a national problem that results from very unsustainable forestry sector management in the previous decades and country's very limited experience with tree planting. Good MAI rates in Indonesia result from good plantation management schemes, access to trainings and knowledge and people's own motivation in plantation work.

A common unexpected observation is the poor environmental performance of both studied plantations. Social paradigm as such was designed to address social as well as environmental externalities coming from large scale industrial plantations. Ideally, as opposed to cloning practices and large scale monoculture plantations by the companies, it could reintroduce native species, bring mosaic plantations of different species and age, limit the use of chemicals etc. Nevertheless due to many factors that may range from difficulties in accessing knowledge and technology, limited environmental awareness, urge to develop on environmental costs, the discussed plantations performed quite poor in the analysed environmental indicators.

### *Neoliberal paradigm*

The neoliberal paradigm plantations studied on the example of two private companies from Indonesia and Paraguay also shows a substantial explanatory power of the applied concept. After the brief discussion of local performance of both plantation case studies and their reference to the ideal-typical neoliberal paradigm plantation, the following conclusions should be put forth:

#### *Convergent observations*

Both case studies fall close to the assumptions derived from the global analysis of the changing approaches to plantations and the neoliberal paradigm features. Historical context, land issues and land conflicts, local involvement, plantation benefits, decision-making schemes, and financing mechanisms are all confirmed assumptions observed in the field in both countries. So are the high MAI rates and a limited environmental performance.

#### *Divergent observations*

A common unexpected observation that will be further discussed in subchapter 6.2 is the higher social performance and moderate overall economic performance of the case studies. The neoliberal paradigm was expected to overlook many social problems. And this is visible for example in land conflicts or limited local involvement in decision making and limited membership of stakeholders in the local organizations. However, some social aspects are especially cared for - as the work safety standards and trainings. Also companies provide some services to the local communities that are not directly related to their local operations.

The economic performance of the studied plantations proved to be weaker than expected. In some categories, as connection to export markets, plantations under the neoliberal paradigm are very strong. But the general profitability is significantly decreased by insecure environment for the investment. It is also visible that tree growing is not the most lucrative undertaking in the wood production chain.

It was expected to oversee many social issues and this has been confirmed in social clusters selected for the analysis as land conflicts or limited local involvement in decision making and limited membership of stakeholders in the local organizations. However, some social issues are cared for and better implemented than on other plantations. Here safety standards and good access for training for the company's employees (even subcontracted)<sup>34</sup> are the main factors that increase the overall social performance. Also companies provide some services to the local communities that are not directly related to their local operations. It may be seen as both an instrumental behaviour to improve the difficult environment for investments but also as an

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<sup>34</sup> For many other neoliberal plantations this is not the case and in many developing countries plantation accidents, especially in logging, but also in pruning and site-clearing are common. For exemplary data from Chile and Malaysia see: ILO 1991.

increased responsibility of companies operating in poverty areas, where governmental services are so limited.

The economic performance of the studied plantations proved to be weaker than expected. In some categories, as connection to export markets, plantations under the neoliberal paradigm are very strong. But the general profitability is significantly decreased by insecure environment for the investment. It is also visible that tree growing is not the most lucrative undertaking in the wood production chain. Also alternative land uses in both areas as soybean and cattle breeding (Paraguay) or palm tree and rubber industry (Indonesia) are far more profitable and shorter investments compared to tree planting.

### ***Neoliberal modified paradigm***

The neoliberal modified paradigm plantations analysed on the example of the Paraguayan outgrower scheme clearly show that the paradigm can be used as a successful alternative between the social and neoliberal paradigm plantations.

#### *Convergent observations*

The neoliberal modified plantation case study has a relatively high predicting capacity, the historical context for the plantation, secure land issues, limited land conflicts, high local involvement, good range of local benefits, clear and balanced governance, combination of capital sources (financial and other assets), good growth rates and strong economic performance are all features associated with the paradigm that were well illustrated by the case study.

#### *Slightly divergent observations*

Some partly divergent observations were the poor environmental performance that could be expected to be enhanced as the plantations are strongly anchored locally. Also limited sources of knowledge and expertise might have been better developed.

#### *Divergent observations*

The strong social performance (stronger than in the social paradigm plantations) was supposed to be high, however it over-competed all alternative paradigms. Therefore it will be separately discussed in the 6.2 section.

Some partly divergent observations were the poor environmental performance that could be expected to be enhanced as the plantations are strongly anchored locally. This weak environmental focus in the case study partly results from the weak national environmental standards and their implementation but also a general lack of environmental awareness among local tree growers. Trees in the area are seen as a cultivation crop and all practices enhancing productivity are welcome. Also limited sources of knowledge and expertise might have been



better developed, but this is a result of the general plantation situation in Paraguay. There is no knowledge on afforestation or reforestation that would be anchored through generations and apart from the cooperative, people look for seeds or technology by smuggling unsure Brazilian provenances and not looking to the national organizations or universities for assistance and advice.

The strong social performance (stronger than in the social paradigm plantations) was expected to be visible in this scheme; however, in fact it out-competed all alternative paradigms. The cooperative was able to enhance participation, provide good work safety conditions, assure good information circulation, provide access to services and manage human resources in a successful and long-term perspective without trade-offs in other social indicators. This can be attributed, however, to the cooperative and social capital levels and could be difficult to replicate in outgrower schemes in different areas. Tree planting is only one area of numerous cooperative's activities and its organizational and management capacities have long and positive experience.

### ***Global political paradigm***

The global political paradigm in plantations studied with the help of the Paraguayan CDM project is the most divergent case. Taking into account a big flexibility of the paradigm to its implementation on the ground, this additionally limits its predicting powers. To summarize briefly the discussion of the local realities from the Paraguayan CDM plantation and its comparison with the features of the global political paradigm, it can be concluded that:\

#### *Convergent observations*

The studied plantation falls closely to the initial assumptions in some fields, as the historical context of the plantation establishment, land related issues and no existence of land conflicts, local perception of plantation benefits, horizontal, participatory governance, sources of funding, growth rates and economic performance (that is not well developed in absolute terms but assures relatively equal wealth redistribution).

#### *Slightly divergent observations*

One observation is partly confirmed and partly divergent, as local involvement is moderate and it was expected to be as high as in social forestry projects.

#### *Divergent observations*

Some rather unexpected observations include a moderate social performance where work safety was not given enough attention, but also issues related to access to services and human resources show significant problems. Moderate environmental performance is another observed issue. Also local knowledge and expertise have not been applied in the plantation establishment and management.

One partly divergent observation was the moderate local involvement in plantations decisions that was expected to be as high as in social forestry projects. This may be due to the low social capital level in the area but also to the project's internal complexity that discourages from active participation.

Other unexpected observations include a moderate social performance where work safety was not given enough attention, but also issues related to access to services and human resources show significant problems. But this results show that mechanisms planned on the global/national level cannot be well implemented on the ground even with the best will of the project's donors. In the in-depth interviews it was clear that the project time span was too short to work on social issues. Additionally even where mechanisms for participation have been assured they proved to be inefficient. People in the area are mostly passive recipients of the project benefits and there is no sense of ownership and engagement towards plantations.

Moderate environmental performance can be explained with the general deteriorating environmental situation in the country. But it can be also said, that the global focus may lead to neglecting the local realities. Stakeholders learned about oxygen and climate change but have not been fully informed about the local environmental needs and priorities.

Lastly, limited sources of knowledge and expertise show that in this plantation case local knowledge has not been used in the project. This is clearly related to the already mentioned general knowledge deficiency in reforestation issues (not practiced for generations in Paraguay). Nevertheless the project could slowly introduce new practices and "store" them in local institutions, rather than send the extension agents, who became trusted but soon left the area and the people unattended.

### **6.3 STRENGTHS AND WEAKNESSES OF THE STUDIED PARADIGMS**

The comparative analysis presented in this Chapter lead to the identification of particular strengths and weaknesses linked to the analysed plantation paradigms.

- Land issues were most successfully managed in the social, neoliberal modified and global political paradigms

- Local participation and involvement in decision making was also enhanced in the social, neoliberal modified and global political paradigm
- Similarly inclusive and balance governance was typical for the three mentioned paradigms
- Provision of a vast range of local benefits can be seen as the domain of the social and global political paradigm
- Direct provision of national benefits was at the core of the industrial national paradigm. Nevertheless national benefits, less direct can be attributed to all paradigms
- The social paradigm was visibly related to diversified sources of knowledge
- High growth rates can be potentially achieved in all paradigms, depending on access to technology and knowledge
- Work safety was visibly better in the industrial national, neoliberal and neoliberal modified paradigms
- For the good overall economic performance it was highly important to create a good environment for plantation investment, high growth rates or market access were not enough for a vital economic investment – this was well implemented in the neoliberal modified paradigm
- The overall environmental performance was substantially increased with the very long rotation lengths – a fact especially visible in the industrial national paradigm represented by the plantation of teak
- The overall social performance was significantly better when there were well functioning local institutions that were involved in the plantation projects, as in the social and neoliberal modified paradigm plantations

Success factors are only signalled here as a direct result of the comparative analysis and integration between the paradigm and case study level. Later on, in the Chapter 8 on lessons learned, they will be carefully studied as interesting practices to enhance socio-economic and environmental performance of plantations. But the following Chapter 7 will look for alternative explanations and limitations of the paradigm concept.

## Chapter 7 – Methodological Challenges and Alternative Explanations

Having presented the empirical analysis employing the paradigm typology, this chapter discusses the challenges and limitations of that approach. Beginning with methodological limitations (7.1) it then moves to a review of explanations alternative to the paradigm approach (7.2) and concludes with more general problems with political economic analyses of the forest plantations (7.3).

### 7.1 METHODOLOGICAL CHALLENGES OF THE PARADIGM APPROACH

The global perspective on plantations based on the paradigm approach involves a high level of generalization and may overlook particular national or local experiences. Also the particular paradigms offer a high degree of abstraction and generalization and it may be argued that real plantations are difficult to be classified according to *pure* paradigms. Paradigms in the typology introduced in this study should be treated as *ideal types*, in the sense proposed by Max Weber<sup>35</sup> (Weber 1978). The study of the plantation sector development in Paraguay and Indonesia with the paradigm approach reveals significant differences in both countries. However, many paradigm characteristics are also present in both scenarios and the abstracting general paradigm theory may be successfully used to analyze plantation trends at the national level. Despite the methodological limitations, the paradigm approach is helpful to offer a meta-analysis of plantation development. It serves as a framework for the understanding and interpretation of the various plantation discourses and plantations representing them. Even if the explanatory power is sometimes compensated, the paradigm approach should lead to a better reflection rather than to hold for all complex national and local plantation realities. It can be claimed that the paradigm concept is insufficient in precision and depth. But it needs to be argued that those criteria are

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<sup>35</sup> In his „Economy and Society”, Weber wrote that social scientist seek “to formulate type concepts and generalized uniformities of empirical process. ... As in the case of every generalizing science, the abstract character of the concepts of sociology is responsible for the fact that, compared with actual historical reality, they are relatively lacking in fullness of concrete content. To compensate for this disadvantage, sociological analysis can offer a greater precision of concepts. ... In all cases, rational or irrational, sociological analysis both abstracts from reality and at the same time helps us to understand it, in that it shows with what degree of approximation a concrete historical phenomenon can be subsumed under one or more of these concepts” (1978: 19).

compensated by analytic utility, breadth, innovation and relevance of the paradigm concept (Gerring 2001: 21).

## 7.2 THE PARADIGM CONCEPT AND ALTERNATIVE EXPLANATIONS

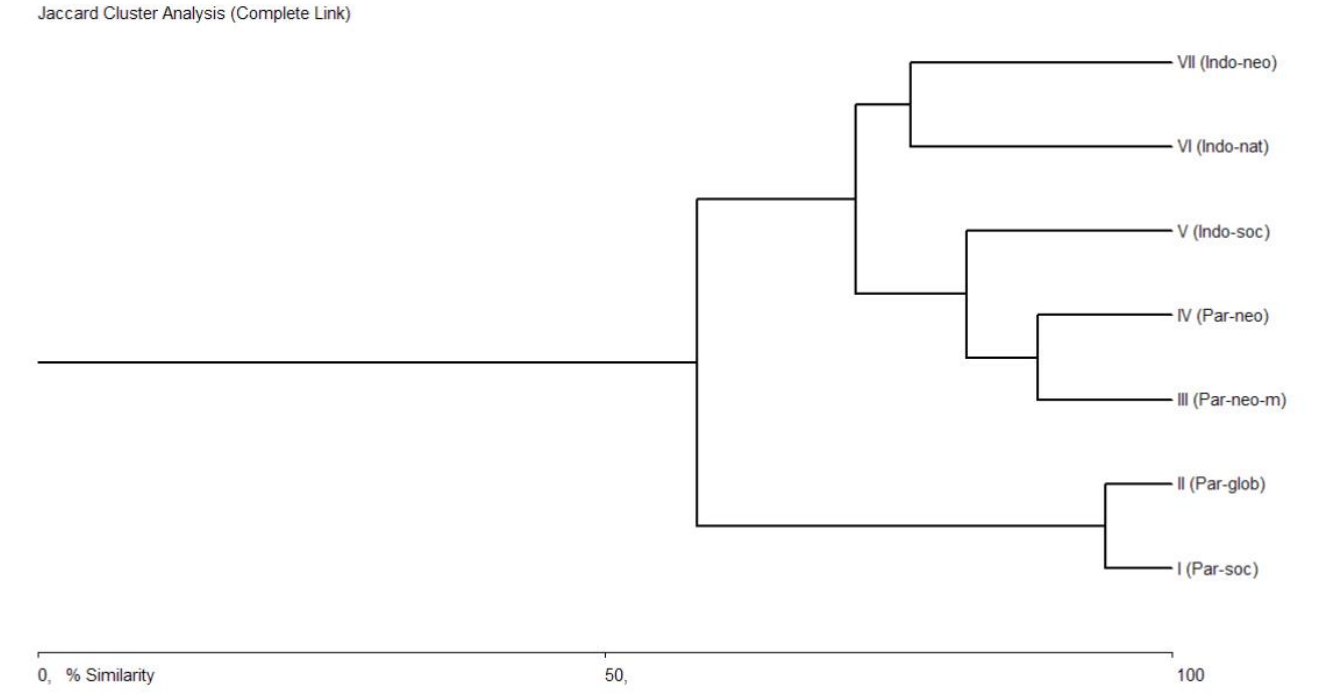
The paradigm concept as a tool of studying the foundations of the political economy of forest plantations, and the socio-economic impacts of different plantation types, offers a macro diagnosis which necessarily implies abstraction, simplification and generalization. Its significant explanatory capacity has its tradeoffs. Global approaches are always mediated through specific national characteristics and particular local conditions. Those levels should not be disqualifying any attempts to generalize but cannot be omitted in a profound analysis. Therefore what constitutes an important strength of the paradigm approach can be seen as its main limitation at the same time. In this study all levels (global, national and local) were taken into the analysis.

One of the main problems of such interpretive methodologies is that the actual results measured using qualitative and quantitative methods on the ground could be attributed to other factors than those proposed. To account for this possibility, two statistical tests were conducted using the data acquired in the Multi Criteria Analysis (clusters of indicators, see: Annex to Chapter 5) of plantation case studies. The following figures (7.1 and 7.2) show the results of a *group average link analysis* and *principal component analysis*. The purpose of this additional analysis was to discover similarities and difference between plantations that cannot be accounted for by the paradigm concept.

It is visible (Figure 7.1) that the most similar plantations with over 90% similarity are case study I: Smallholder plantation with development aid and case study II: Smallholder plantation with Clean Development Mechanism (CDM), both from Paraguay. This conforms to the paradigm fit analysis where it was observed that the global political paradigm performs locally in a similar way to the social paradigm (see: Chapter 6). Another similarity is between the other cases from Paraguay corresponding to the neoliberal modified and neoliberal paradigm: case study III: Out-grower scheme in Itapúa and case study IV: enterprise POMERA.

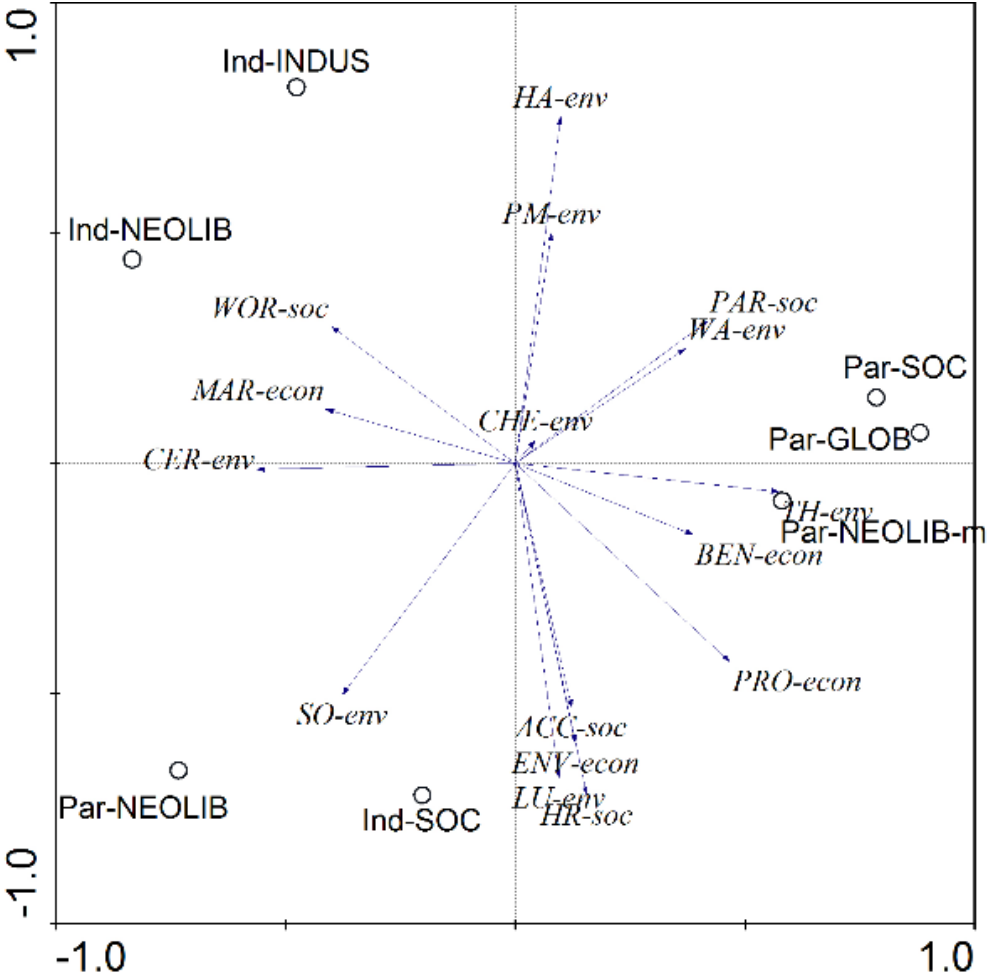
Two case studies from Indonesia: case VI: State enterprise Perum Perhutani and case study VII: Enterprise Musi Hutan Persada (MHP) show similarities up to about 80% in the analyzed indicators. Between them and the Paraguayan companies the Indonesian social paradigm plantation is located (case study V: Community plantation through Community Forest Owners Association APHR). It is therefore more similar to the neoliberal modified plantation from Paraguay (case study III: Out-grower scheme in Itapúa) or social and global political plantations from Paraguay (case studies I and II) than to the neoliberal and industrial national plantations from Indonesia (case studies VII and VI).

The analysis shows that similarities occur on the country axis; however, grouping is only possible between related paradigms. The neoliberal and industrial national paradigm cannot be linked with social and global political, even when the plantations are organized under the same national and local conditions. But the neoliberal with industrial national, neoliberal with neoliberal modified or social with global political can show visible similarities when the local and national conditions are the same.



**Figure 7.1** – Results of group-average-link analysis (Source: own elaboration)

Figure 7.2 shows the deterministic factors for plantations similarity. The country distribution shows that in Paraguay the plantation cases are more diverse on the x axis while in Indonesia they are very much diversified on the y axis. Indonesian plantations are located in two quarters, Paraguayan in three. Due to several factors (participation, water issues, environmental threats and benefits) smallholder plantations from Paraguay (social, global political and neoliberal modified) are located close to each other. The distribution of case studies on the x axis shows that the Indonesian and Paraguay neoliberal paradigms are on one extreme, while social and global political paradigms from Paraguay are on the other extreme. Closer to the neoliberal paradigms is the Indonesian industrial national case study and the neoliberal modified case is closer to the social paradigm from Paraguay. Therefore national conditions are not deterministic for plantation outcomes.



**Figure 7.2** – Results of principal-component-analysis (Source: own elaboration). Social clusters: PAR: participation, WOR: work safety and standards, ACC: access to services, HR: human resources. Economic clusters: BEN: benefit, MAR: market access, ENV: environment for investments, PRO: profitability. Environmental clusters: PM: plantation material, WA: water, LU: land use change, TH: threats, SO: soil, HA: habitat, CHE: chemicals and CER: certification.

### **7.3 OTHER LIMITATIONS OF THE POLITICAL ECONOMIC RESEARCH ON PLANTATIONS**

Political economic analyses of plantation forestry necessarily have to downplay some other important factors, such as the technical and silvicultural side, which has only been signaled in this study. Moreover, the review of literature in Chapter 1 illustrated the plethora of angles from which the subject of political economy can be approached. This study drew on a number of them. It was close to the socio-economics in political economy but was also inspired by institutional approaches, policy oriented analysis, as well as critical, historical and post-structuralist International Political Economy. Each of these approaches has its limitations. The institutional and policy approaches overemphasize the role of the state versus global capital and market forces. In the domain of plantations this leads, perhaps, to the erroneous conclusion that individual states alone can govern plantation forestry properly, as if external forces could be bracketed out. This is where critical political economy, which focuses on different forms of power and hegemony, can be helpful. It too, however, has limits. Whether one agrees with it or not, forest plantations will be developed on a massive scale. It is important to adopt a pragmatic, problem-solving attitude which treats multinational corporations as well as imperfect governments of the developing world as part of the solution, rather than as the main problem. Lastly, the historical and post-structuralist approaches, focusing on the evolution of ideas and knowledge productions, are a valuable addition, but cannot substitute hard economic analyses and quantifiable empirical research. This study tried to provide a historical conceptualization of plantation paradigms precisely as an additional perspective and critical foundation for future discussion – not as an ultimate answer. The quantitative methods used in the case studies were operationalizing the global-local link, but they are merely a small fraction of the exploratory research that needs to be conducted in the present changing climate for plantations.

Furthermore, this study shows that many important forestry concepts are socially constructed and that it is necessary to go beyond the dominant discourses and reflect on the historical meaning, performance and implementation of plantations worldwide. Looking at changing concepts, macro trends and constructing theoretical models is important to diagnose the current status, reflect on the historical developments and shape future policies. Such research is exposed to many methodological and practical challenges. Practical challenges are related to the scope of the study, its interdisciplinary character and the fact that it was conducted by one person. All



possible political economy research on plantations will face similar following methodological challenges.

### **7.3.1 Problem with reliable data and changing plantation definitions**

Historical analysis of plantations is challenging due to the difficulty with obtaining reliable data and due to the problems with changing definitions, an issue profoundly discussed in Chapter 1.2 and Table 1.1. Plantation-related definitions vary among authors and organizations and change over time. The UNFCCC definition struggles show how relevant forestry definitions are and how politicized such defining debates can be. Definition problem leads to problems with reliable and comparable data. Any study with a global and historical focus will face a double methodological problem in comparing plantation data in time and across countries.

### **7.3.2 Problems of explorative research**

Explorative research is a valuable approach of learning about new phenomena. It provides new insights and indications, it is useful for new conceptual frameworks and where data is difficult to collect. But it has significant limitations and one needs to be very careful with conclusions and generalization. The iterative research process reported in this monograph has attempted to explore and understand a vast array of data in a rigorous, scholarly manner – but it nevertheless builds on much qualitative data that is difficult to compare.

### **7.3.3 Problems with indicator setting**

Studying such complex phenomena in a real life context requires careful methodological considerations. There are significant methodological trade-offs at the stage of research design, method selection and preparation of assessment categories, criteria and indicators. The technical literature on the criteria and specific indicators to describe and evaluate plantations is robust. Such criteria were worked out by FAO (2006) as well as ITTO (1993) or other related guidelines (see also: Mendoza and Prabhu 2000), namely the hierarchical framework for the formulation of sustainable forest management standards (Tropenbos 1996), revised ITTO criteria and indicators for the sustainable management of tropical forests (2005), ITTO tropical forest tenure assessment (2011), CIFOR principles, criteria and indicators for SFM (from: Mendoza and Prabhu 2000), ILO criteria for SFM (from: Poschen 2000) or ISEAL code of good practice for assessing the impacts of social and environmental standards systems (ISEAL 2010) or sectorial indicators (as forest governance at the local level, cf. Secco et al. 2013).

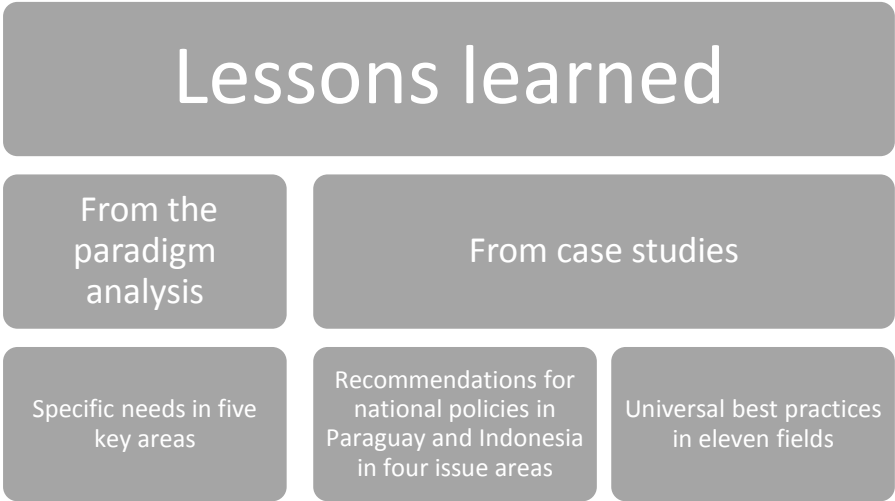
However, these criteria are often not used to study the realities and dynamics of plantation efforts – an important gap that needs to be filled. Additional aspect is related to a synthetic evaluation with both environmental and socio-economic parameters. It is difficult to develop the indicator set and methodologically challenging to keep appropriate balance between the different domains, weigh particular indicators to achieve the possibly most objective evaluation.

#### **7.3.4 Problem of single-case study dominance**

Macro studies, comparing across a wide set of cases, using quantitative methodologies (large-*n*), or mixed methods (e.g. Qualitative Comparative Analysis), are difficult to conduct at the global and national (country) level. This is due, among other factors, to fragmented data, changing definitions and concepts and difficulties in obtaining reliable data signaled earlier. It is even difficult to compare hard economic data from macro and micro-economic registers. Such studies are thus rare, while the field of plantation research is dominated by single case-studies. The case study method applied to single sites has many benefits. Most importantly, it offers a profound analysis of the situation; but that depth is traded for limited generalizability and explanatory power. It makes comparison across cases difficult, as each case study usually asks different research questions and applies different techniques, unless it is part of a larger umbrella project. In the face of such incomparability, the field indeed faces the problem of “not seeing the forest for the trees” – becoming overburdened with singular, case-specific knowledge that does not easily add up to wider diagnoses that are so needed. Multiple case studies (especially cross-country comparisons) would be a way out, but they are difficult to conduct and also not yet that common in the field. A harmonization process of forestry related definitions started by FAO in collaboration with IPCC, CIFOR, IUFRO and UNEP should lead to better compatibility, consistency and comparability of data and open the future research endeavors to go beyond the current single case study limitations (UNFF 2003: 13). On the other hand, compiling and systematizing data and policy implications gathered through case studies in larger, accessible databases could allow for lessons-learning and the buildup of knowledge in the discipline – a very important feature both for the science and practice of plantations.

# Chapter 8 – Lessons Learned, Conclusions and Outlook

This chapter presents lessons learned from the paradigm analysis. They are divided into four subchapters: general lessons for the forestry community from the global historical paradigm analysis (8.1) and lessons from case studies (8.2). Lessons from case studies are further divided into lessons for Paraguay and Indonesia and more universal best practices on the plantation level. The Figure 8.1 below illustrates the different types and levels of lessons learned and best practices resulting from this study.



**Figure 8.1** – Lessons learned: an overview (Source: own elaboration)

To complete the analysis the last subchapters provide conclusions (8.3), reflect on the future outlook (8.4), and list further research steps and gaps in the domain of tropical plantation forestry (8.5).

## 8.1 LESSONS FROM THE GLOBAL HISTORICAL PARADIGM ANALYSIS

It is important to critically assess the evolution of plantation paradigms and its parallels to global developments. The table 8.1 presented below lists the main critical observations from the historical plantation analysis from the global perspective that lead to paradigm identification in Chapter 4 and the possibilities to improve future plantation politics.

<p>Need for a proactive involvement of the epistemic community in order to better shape forest/ plantation policies rather than adapt to external developments</p>	<ul style="list-style-type: none"> <li>• Paradigm shifts imply slow internal learning, they are mostly responses to other developments 'on the outside' – in economic and development policies on the global arena</li> <li>• The <i>industrial-colonial</i> paradigm was not even questioned after the end of the colonization era but the <i>industrial-national</i> paradigm remained detached from local inputs, bringing social conflicts, environmental degradation and false incentives</li> <li>• The emergence of the <i>social</i> paradigm was caused rather by external factors: strong criticism of failures in plantations and changes in development aid</li> <li>• The emergence of the <i>neo-liberal modified</i> paradigm was a late response to the plantation governance architecture caused by social conflicts rather than its own innovative driving force</li> <li>• Need for new intellectual constructs and theoretical models for future plantations</li> </ul>
<p>Need for inter-disciplinary exchange and inter-sectorial coalitions</p>	<ul style="list-style-type: none"> <li>• Plantations have been subsumed under different global regimes</li> <li>• Even with the private certification schemes combining good practices on plantations with market information (Cubbage <i>et al.</i> 2010a), forestry regimes become even further fragmented and non-transparent</li> <li>• The forestry community seems weak in giving shape to the governance architecture dealing with climate change and undergoes political marginalization in the on-going negotiations</li> <li>• Need for synergies with other scientific disciplines on the one hand and technical sectors on the other</li> <li>• Slow positive changes as the last World Forestry Congresses inclusive agendas and important debates (WFC Bulletin 2003 and 2009) or the emergence of The Forest Dialogue (TFD 2013), a catalyst of expertise-sharing between individuals representing different stakeholder categories</li> </ul>
<p>Need for self-reflection and learning from experience</p>	<ul style="list-style-type: none"> <li>• Today, once again a global enthusiasm for large-scale tree-planting in the tropics can be observed, perceived as a solution for global problems (previously only wood demand, now additionally climate change mitigation)</li> <li>• Need for good research and documentation of past failures in plantations from the 1970s and 1980s where large-scale planning in plantations resulted in negative social, economic and environmental externalities. Case studies can bring scientific and technical insights on plantation successes and failures, databases and quantitative comparative analyses produce new knowledge</li> <li>• Need for bottom-up perspectives on particular plantation issues and monitoring of the effects global policies have on the real plantations</li> <li>• Some positive bottom-up learning initiatives are emerging within the forestry epistemic community as the New Generation Plantation project, which collects knowledge and good practices to promote better plantation management across the globe (NGP 2013) or certification, insistence on transparency, rising consumer awareness or engaged journalism (see: Carrere and Lohmann 1996)</li> </ul>
<p>Paradigm plurality – using the opportunity for learning</p>	<ul style="list-style-type: none"> <li>• As the historic analysis indicates, when one paradigm gets a hegemonic position, other views can face marginalization.</li> <li>• It is important to build dialogue between the different paradigms</li> <li>• With the waning attention for the <i>social</i> paradigm, both its positive and negative experiences could be forgotten instead of being used to guide new plantation efforts. However, both the climate mitigation perspective and the social paradigm could be compatible to assure benefits for the local populations, investors and the international community</li> </ul>
<p>For a more transparent global regime</p>	<ul style="list-style-type: none"> <li>• Complex institutional set-up with various actors, duplicating work and producing overlapping guidelines</li> <li>• The plantation regime remains based on soft law clusters with a growing amount of fragmented and to some extent contradictory rules (cf. McDermott <i>et al.</i> 2010). Standards elaborated by intergovernmental organizations (FAO, ITTO), certification bodies (FSC and other, see: Masiero and Secco 2013) or UN forums and conventions (UNFF, UNFCCC, UNCBD, UNCCD) cause an institutional chaos and may provide contradictory incentives (Rosendal 2001, cf. UNFF 2003: 8)</li> <li>• Need for homogenization and synergies in the governance architecture, rather than creating new institutions and standards</li> </ul>

**Table 8.1** – Critical observations from the plantation paradigm analysis (Source: own elaboration)

The issues discussed in the table include the need to increase adaptive capacity of the forest plantation domain to respond to external developments; facilitate more inter-disciplinary exchange and inter-sectorial coalitions; support for evidence gathering and learning from failures; the opportunities and threats connected to paradigm plurality; and the need for more transparency (cf. Rosendal 2001, Werland 2009, Szulecka *et al.* 2014).

The debate on plantations is highly important in the face of demographic growth, risks coupled with climate change and world economic crises (compare: van Bodegom *et al.* 2008). It should call for a problem-solving attitude in the field, better synergies with other scientific disciplines and technical sectors, historical diagnosis and records on plantations' performance and externalities, establishment of learning mechanisms (forums), an internal dialogue between the different paradigms and a more transparent institutional setting on the global level. Equally important are bottom-up perspectives on particular plantation issues and monitoring of the effects global policies have on the real plantations. Case studies may bring both scientific as well as technical insights on plantation successes and failure but there is a need for rigorous multiple case study research and plantation databases with comparative quantitative analyses.

## **8.2 LESSONS FROM THE CASE STUDIES**

### **8.2.1 Paraguay**

In the historical paradigm analysis of plantations in Paraguay with case studies of social, neoliberal, neoliberal modified and global political paradigms, particular lessons may be identified. The plantation sector in Paraguay has a relatively short history but presents a diversified plantation experience.

The industrial national paradigm and initial plantations developed by the state in the dictatorial time proved disappointing. Only ca. 5000 hectares of plantations were established, a marginal figure compared to the ambitious plans. The state withdrew from direct plantation development to indirect support of other plantation paradigms.

The social paradigm in Paraguayan plantations was largely promoted by foreign aid agencies that considered tree planting an important part for rural development. Positive results of the

recent PMRN project may change a passive attitude of smallholders waiting for external help into active rural participation and integration of timber plantations in the small farming ‘portfolios’.

The neoliberal paradigm in plantations in Paraguay started relatively late, the big corporate investments came with the Law no. 536. The companies here generate profits at the plantation level (no vertical integration like in most of the Indonesian plantations with corporate ownership), but plantation investments are perceived as unsecure (due to the long investment timeframe) and less profitable than alternative land uses (especially soybean and cattle breeding).

The neoliberal modified paradigm in Paraguay emerged in the recent decade in the cooperative scheme. Out-grower schemes have not been widely replicated, but initial promising results show that they can be an attractive alternative in the development of the Paraguayan plantation sector.

Paraguay belongs to the few countries, where the global political paradigm in plantations became tested on the ground. But the CDM plantation was implemented locally in a way typical for the social paradigm plantations, with little awareness of the local population of its envisaged climate change mitigation role.

Currently Paraguayan decision-makers show interests in the promotion of forest plantations nationwide. Some meetings took place already for the redesigning of the legal framework so as to provide more incentives towards the development of the plantation sector (Bohn 2011). Within INFONA consultations are held for the adequate redesigning of the Law 536 (1995) providing incentives for reforestation. Another approach is the Law of Forestry’s Take-off (*Ley de vuelo forestal*) assuming possibility for foreign investments in plantations without land transactions but based on contract agreements between the land owners and investors. For the new efforts to be successful, it is necessary to understand the complex plantation landscape and promote sound forest policies with adequate institutional, political and sectorial changes.

The paradigmatic analysis and in depth expert interviews with important stakeholders allowed for the identification of some key recommendations for the future development of plantations in Paraguay. Adequate plantation policy requires a profound historical and *status quo* diagnosis

of the sector. At this stage the design of support for plantations in Paraguay should particularly address the following issues listed in the Table 8.2.

Forestry issues	Institutional issues	Political issues	Sectorial issues
Expanding and documenting plantation related knowledge and good plantation practices	Written agreements between the institutions over their plantation related competencies	Acceptance and commitment from the government to develop plantation estates in the country	Supporting integrated land use planning
Incorporating certification schemes and carbon emission reductions mechanisms	Improving the internal bureaucracy	Potential incentives to establish a critical mass of plantations	Improving social and ecological standards
Facilitating national debates (on Eucalyptus etc.)	Well executed controls and monitoring without corruption	Guarantees for legal security in plantation investments	GIS monitoring with satellite images
Alliances with global partners			Elaboration of credit lines and necessary financing mechanisms for both smallholders and large investors
Promotion activities			
Supervision of the executed plantation projects			

**Table 8.2** – Improvement areas for the plantation environment in Paraguay

**8.2.2 Indonesia**

As the historical paradigm analysis and the Indonesian case studies provided for the national, social and neoliberal paradigms show, each ideational construct for the plantation organization implied particular strengths and weaknesses. The plantation sector in Indonesia has a long history and a diversified experience. The contemporary industrial national paradigm, which provides the rationale for Perum Perhutani’s plantations, is a direct descendant of the centralized, colonial paradigm first introduced by the Dutch. It can be claimed that some early mistakes conducted under the colonial paradigm (regarding land use planning, conflict with the

local population, technocratic silviculture) have been replicated by the national paradigm. This paradigm was expected to emphasize centralization, industrial scale and benefits for the national economy over local social and environmental considerations. However nowadays some positive changes and pressures from both the outside and the domestic political sphere lead to the reinterpretation of the national paradigm, emphasizing that it should not only add to the national growth but also to achieve more local goals by adapting a responsible forestry approach.

The more recent social paradigm, which emerged internationally as an attempt to correct forest plantation policies and address social externalities and questions of benefit distribution, is still at a fairly early stage of development in Indonesia. The neoliberal paradigm, which combines an industrial orientation with private investment and land ownership, can be expected to be more economically efficient and is hoped to deal effectively with industrial pressures on the natural forest – both of which are to date not proven by empirical evidence.

The analysis of current plantation projects indicates that the social paradigm, in the indicators that have been selected for comparison, is most promising due to its balanced performance and the ability to provide a range of social, economic and environmental benefits. The noted shortcoming in the social indicators is inadequate safety measures on smallholders' plantations. What is debatable is also the economic performance of a scaled-up social plantation project.

The national and neoliberal paradigms illustrate that they are limited in achieving social goals (although social programs introduced both by the state company Perum Perhutani and the Musi Hutan Persada already show some promising results). The national and neoliberal paradigm have an economic advantage from access to financial mechanisms, markets, and can better deal with high initial costs for plantation establishment (in the community plantation of sengon (*Albizia falcataria*) it was 300-400USD per hectare while in case of teak and acacia it was already exceeding 1200USD, limiting “entrance” for smallholders without loan access). However corporate and state large scale uniform plantations have their own limitations as thefts, lacking local value added, or other competing land uses. Yet for the neoliberal plantation sector, discussed on the example of MHP and its local engagement and certification, evidence suggests that plantation business reaches beyond the silvicultural activities of planting trees. Such expansion



of corporate responsibility should be actively promoted by the state and forestry services, as most of the HTI concessionaires lack the incentives to voluntarily obey similar rules.

Regardless of the individual strengths and weaknesses of different plantation paradigms, a learning process providing best practices from different paradigms could help all plantations to achieve a better side-performance.

Especially social paradigm, as the first one to address the negative externalities of technocratic forestry, should be better understood and further promoted through HTR scheme. Its experiences and knowledge generated in such plantations as the case study from Kalimendong are a great starting point for learning lessons on plantation sustainability. An important lesson from that well organized and visibly successful plantation is the need to support plantation scale-up, by facilitating smallholders' access to loans and plantation credits. A recently proposed policy innovation on the national level, introducing a possibility of state-loans distributed through farmer associations can be a step in the right direction if its implementation stays responsive to the feedback from smallholders. This and other lessons should guide future paradigms in tree planting – for example the emerging contracts between smallholders and companies (outgrower schemes). Such contracts already exist in Indonesia but are mostly organized as land rentals. However if they give more knowledge transfer and responsibility to small farmers, while the companies would provide access to knowledge and markets, they could potentially combine the strengths of social and neoliberal paradigms. Here too, the involvement of the state in protecting the weaker side of the contract – the smallholders – is necessary for the arrangement to bring about the expected results.

The analysis and in depth expert interviews with key stakeholders help to indicate some crucial recommendation areas for the Indonesian plantation policies. Especially the following issues need to be taken into account:

Forestry issues	Institutional issues	Political issues	Sectorial issues
Improving forest governance (e.g. overlapping permissions)	Simplifying bureaucratic procedures	Combating adverse effects of decentralization policy after 1998 that lead to powerful and corrupted elites at lower levels	Supporting integrated land use planning
Improving insufficient forestry capacities	Well executed controls and monitoring without corruption	Understanding and addressing the needs of peasants, enhancing participation and empowerment of local communities to become proactive in shaping small scale plantations	Creating better access to market and increase of the bargaining position of smallholders
Implementing and monitoring the rules on plantation fed pulp mills (capacities of the mills and amount of plantation wood)			Agrarian reform
			Mechanisms to resolve land tenure issues (especially Sumatra, Kalimantan)
			Monitoring of certification in plantations

**Table 8.3** – Improvement areas for the plantation environment in Indonesia

### 8.2.3 Best practices from the local plantation case studies

As Chapter 6.3 has shown, the research results from the local level case studies and paradigm fit allowed for identifying some best practices for plantation establishment and management coming directly from the analysed plantations. These will be discussed in the next subchapters.

#### *Resolving land issues*

Where land use rights are a matter of conflict and where overlaps in land rights exist, plantations will never fully realize their social and economic goals. Hierarchical approaches practiced under the industrial national and neoliberal paradigm only heated such conflicts, lead to land “invasions”, arson and thefts. For companies plantation management requires a good understanding of local conditions. The Paraguayan POMERA works with the environmental foundation “Moises Bertoni” to facilitate its public relations, especially in respect to the indigenous population. The bigger land scarcity, the more complicated land issues are becoming. The Indonesian company MHP, after implementing its social programs, faces a problem of opportunistic non-residents coming to the plantation site, claiming land and trying to compete with the traditional local population. Only plantations under the social paradigm

with land rights and land certificates assured plantation land stability, with long-term generational thinking. But other paradigms may learn and successfully implement land policies that guarantee similar plantation stability. The neoliberal modified paradigm combines local land ownership with the economics of scale and market access of the company/cooperative. Also the global political paradigm shows significant strengths in terms of land use policies. Although plantations are often organized from the outside, careful cultural and legal assessments prior to plantation establishment help to work out necessary and stable land arrangements.

### ***Local involvement***

The neoliberal modified paradigm plantations can offer interesting practices for increased local involvement that keep a sense of plantation ownership and lead to active participation and co-shaping of plantation outcomes by different stakeholders. In the case of the Paraguayan out-grower scheme this has been successful simultaneously in four areas: assuring a wide membership in local organizations (S1 with a 100% score), popular access to training programs (S2 with a 93% score), community consultations in land use planning (S10 and S11 with 100% score) and access of information and knowledge related to the plantation (S14 with a 66% score). The local cooperative can serve as a good example of a bottom-up organization. It is open for people possessing the land and working in the given area (therefore no national or religious discrimination takes place and opportunistic players who only possess land but are not directly working cannot interfere in cooperatives policies).<sup>36</sup> Training programs for the plantations are administrated by the cooperative and the organization can afford to employ its own technicians.<sup>37</sup> Consultations also take place thanks to the cooperative structures, however all individuals possess their own land rights and make their own decisions. Finally the access to plantation related information in the area is open and transparent, there are leaflets, publications and materials that are distributed and can be obtained at the cooperative's office. Such organization motivates all stakeholders for involvement but also limits the risks and possible conflicts, as plantation contracts are negotiated, written, implemented and monitored. Unlike in external projects, the institutional continuation is guaranteed.

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<sup>36</sup> Therefore it is not possible to live from land rent, but land work is required.

<sup>37</sup> The cooperative is financed by the partners and it deducts certain percentage of its turnout (from the sale of crops, *yerba mate*, milk, beef) for the financial intermediation activities.

### ***Provision of diversified local benefits***

The social paradigm plantations and the global political paradigm plantations can be studied as examples of plantations that balance a wide range of benefits for the local populations. Here already in the plantation planning and tree species selection, various plantation uses are considered. People may need fuelwood or solid timber, may be willing to sell or use it for construction material on sites, and may be willing to establish plantations as their investment fund. In many cases planning the plantation should also take into account the value added possibilities, for example development of the local sawmill or carpentry etc. Also other products as honey may be produced on plantation land. Plantations can add to local environmental services, by regulating water or improving soil conditions. They can be well combined with agriculture and cattle breeding. All these options that are widely implemented in such small scale plantations can be also considered for the social programs of tree growing companies or in out-grower schemes. Local plantation benefits need to be adequately adapted to the local needs and potential markets, as many plantations failed because of insufficient provision of local benefits.

### ***Provision of national benefits***

When the state policy is to support wood export revenues, state companies seem a meaningful option. They assure centralized management, ease of governmental control and long term thinking beyond the investment/revenue timeframes of private companies. Ideally they combine national know-how on field operations and guarantee state revenues that can be invested for the prosperity of the entire society. While it is true that companies provide direct national benefits, in a changing globalized world they are also not immune to shocks as local conflicts or fluctuations of global commodity prices. Therefore the role of state regulation should be sometimes reshaped into indirect mechanisms of plantation support, as investing in knowledge and know-how, legal frameworks, innovation, extension help to smallholders, local associations and cooperatives.

### ***Inclusive governance***

As the governance patterns in the social, neoliberal modified and global political paradigm plantation show, dialogue and cooperation are often key to the plantation success. Especially the social paradigm shows that it is strongly positively correlated with local participation (Pearson correlation at .743 as presented in the Annex to Chapter 6) and the neoliberal and industrial paradigms are negatively correlated with local participation at -.389 and -.612 respectively. Local institutions are often major factors in plantation management as they can store social capital, lead

to optimization of resources, transfer know-how, and establish market connections (cf. Szulecka and Secco 2014). The role of these factors is illustrated with empirical results from Paraguay in the last paragraph discussing the role of plantation related institutions. Studying formal and informal rules in the Indonesian association of producers or Paraguayan cooperative or the cooperation pattern with the third sector are very valuable lessons of local governance. But they are not universal gold standards and it needs to be emphasized that governance on plantations needs to be case specific, adapted to the local particular situation and needs. Successful governance means a good environment for long-term investments.

### ***Combining diversified sources of knowledge***

The social paradigm plantations can be seen as inspiration for combining various sources of plantation knowledge and expertise (social paradigm has a significant positive correlation with diversified sources of knowledge, as presented in the Annex to Chapter 6). Especially in the Indonesian community plantations, stakeholders were very successful in applying diversified sources of know-how (local knowledge, own experience, guidelines from the trainings provided by the national forestry agencies, advice from the university, books etc.). This inspiration allowed the local people to work out their unique agroforestry system and some special local cutting techniques. The original intention was protecting the *salak* trees below, but resulted in high safety standards for the loggers. This bottom-up innovation and experiments proved to be locally very useful and already received attention of Indonesian scientists, hoping to scale-up the schemes and practices nationally and apply them elsewhere. This particular cutting scheme was described by a local expert:

“In Wonosobo they introduced alley cropping with salak (*Salacca zalacca*). Sengon (*Albizia falcataria*) was planted first and then salak was introduced and salak was growing bigger and bigger and when sengon was replanted, all was taken over by salak. The method is based on cords and ropes which are strapped to the branches and elements of the stem that are being cut, and controlled with pulleys by a team of loggers. This way, branches and stem elements fall to the ground only in a narrow radius around the tree, leaving the salak (and the people) unharmed.”<sup>38</sup>

This locally developed method is also now becoming a model for neighboring communities and loggers in the region, which shows how specific local experience can be used.

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<sup>38</sup> Expert interview 25.05.2012

### ***Assuring high plantation growth rates***

Access to good plantation material, know-how, economics of scale, own research and development departments, fast responding to plantation problems are all strengths of the industrial national, neoliberal and neoliberal modified paradigms. It is clear that plantation's scale increases cost-efficiency. But large scale planning is similarly exposed to risks (market fluctuations, social or environmental problems) and many plantations proved unsustainable. Therefore experience gathered under these paradigms should be also diffused to other types of plantations. Here state support may be used to increase access to similar services for other plantations. Alternatively, there is place for supporting know-how exchange and cooperation of associations of producers, communities and other unprivileged groups.

### ***Work safety standards, equipment and trainings***

Compared to the other plantation cases, the analyzed companies (both private and state-owned) managed to implement adequate standards for work safety, which are alarmingly lacking on other plantation sites. For the Indonesian state company work conditions were significantly improved in the recent years, due to the local/national conflicts and international attention. Both companies that have been established in the 1990s (POMERA, MHP) already took FSC standards and tried to build their "brands" as locally responsible businesses, with work safety at their cores. Crucial issues addressed by the companies are a wide and obligatory access to protective clothing and equipment and minimum employment age. Further, a system of insurances for employees and subcontractors guarantees social security in case of incidents or accidents. The score of S3 for access to protective equipment was 100% for workers of the analyzed companies and 93% for outgrower schemes, while it was marginal on smallholder plantations. Also "safety first" awareness rising campaigns increase local support for safety measures. But for many other plantations organized under the neoliberal paradigm in the developing world, this is not the case. Plantation accidents, especially in logging, pruning and site-clearing are widely reported in countries like Chile and Malaysia (ILO 1991). There is a lot of potential corporate learning on how to assure adequate safety standards. Also smallholder plantations organized by the communities or external project implemented as development aid or CDM, even out-grower schemes proved to have significant shortcomings in work safety. Here extension, trainings, campaigns but also specialization in plantation work could be helpful tools to address the needs. Consumer awareness and demand, consumer boycotts, certification assuring the transparency and information are other tools on the demand side to improve plantation work safety.

### ***Economic performance and the role of the environment for investing***

As lessons from Case study III, out-grower schemes in Itapúa Department in Paraguay show, the economic performance of a given plantation is not a pure function of good market conditions and high plantation growth rates. The general environment for investments is highly important to assure long-term investments and profitability of the business. In the analyzed case-study a fair distribution of plantation income, substantial elimination of thefts and plantation related corruption, along with clear land situation and intra-generational thinking combined with local financing mechanisms (loan program) are highly important for the overall economic performance. The same mechanism applies to corporate, state-led, community or individual plantations. Safe environment for investment (with stable national land policies, clear laws, regulated land situation, written and respected plantation-related rules, stable local demographic situation, mechanisms for conflict management and resolution), significantly contribute to plantation long-term profitability.

### ***Environmental performance and the role of long rotations***

As lessons from Case study VI, state enterprise Perum Perhutani, Randublatung Regency in Indonesia prove, environmental plantation issues do not end on selecting appropriate planting material, adapting sound silvicultural practices, limiting machinery use or strict control of chemicals. Plantations' rotation length is a highly important factor that affects other environmental issues related to water, habitat functions or reducing pressure on natural forests. In the analyzed plantation, 80-year rotation cycles for teak trees made local plantations perform many functions of the natural forest (both on a stand and landscape level). In the plantation debate rotation lengths should be more articulated to differentiate between the so called "fast wood plantations" where trees are planted more as agricultural crops and between generational rotations, where trees realize substantial lifespans.

### ***Social performance and the role of plantation - related institutions***

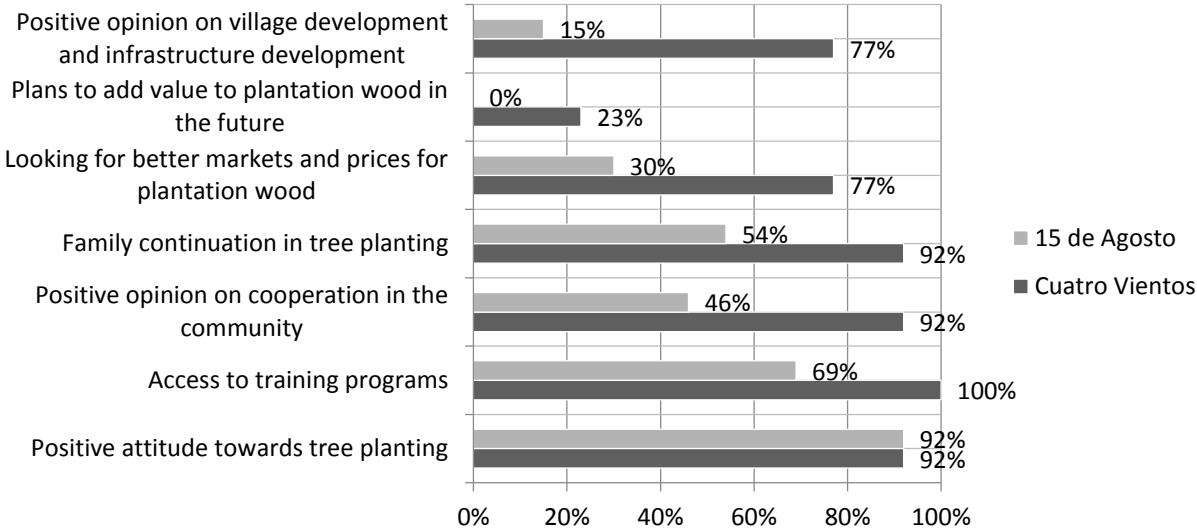
While appropriate silvicultural knowledge would be the first necessary factor for a successful reforestation project, it is not the technical knowledge alone that is responsible for the plantation success or failure. Forestry activities are not implemented in a social vacuum, but highly interlinked with other domains and sectors: social, cultural, institutional, economic, and political. Thus good governance that builds on effective local institutions and social capital enhancement becomes one of the key issues in studying and implementing forestry projects on the ground. Case study III, out-grower schemes in Itapúa Department in Paraguay, is a good example on how to build effective institutions in plantation management, that will provide clear

rules of the game, cope with social capital enhancement , information access or conflict resolution. On the other hand, a within-case comparison of the way the PMRN project in Eastern Paraguay (social paradigm) functions in two communities: Cuatro Vientos and 15 de Agosto, indicates the impact of institutions and governance (Szulecka and Secco 2014). The former is an example of an effectively governed social plantation project, which builds on different local potentials and a robust network of institutions, with some external support. The latter shows that even under the social paradigm dysfunctional project design and lack of support for expanding local institutions can lead to poor overall results. The Table 8.4 below shows crucial differences in social capital in both communities.

Social capital elements	Cuatro Vientos	15 de Agosto
<i>Trust</i>	Towards the cooperative, neighbours and extension agents	Towards extension agents
<i>Rules and sanctions</i>	Clear rules and sanctions executed	Rules not executed, freeriding
<i>Reciprocity</i>	Community joint initiatives to enhance road conditions, neighbourly help	Individualism at work
<i>Connectedness</i>	Various local organizations (Women’s Committee etc.), social centres (school, cooperative), local pride and sense of belonging	Alienation, dissolution of the local organization forms created for the project

**Table 8.4** – Social capital elements in comparison (Source: Szulecka and Secco 2014)

The Figure 8.2 below illustrates how the difference in social capital influences the implementation of the PMRN plantation project. It clearly shows that plantations are more successful, better perceived, bring potential value added, reach better markets, when local institutions are able to “store” plantation related knowledge and when communities are able to cooperate.



**Figure 8.2** – Comparative results of stakeholder interviews in Cuatro Vientos and Choré (Source: Szulecka and Secco 2014)



## 8.3 CONCLUSIONS

The general overarching objective of the study (Section 1.5.2) was to offer a theory-driven diagnosis to the historical development of plantations with inputs from current plantation practices that helps to study, understand and learn from plantation development. To achieve this, different research steps provided an exploratory diagnosis of the way various plantation types function in different settings, and how distinct sets of organizing principles – paradigms – determine their performance in economic, social and environmental terms. This was meant as providing a link between global debates over the way forests are and ought to be planted with local realities, and contrasting certain policy ideas with empirical evidence of plantation case studies on the ground.

The five specific objectives helped to structure the research process and presentation of the main findings.

Firstly, the macro analysis looked for paradigms in tropical forest plantations by providing the global economic context and a thorough historical analysis. The direct result of the macro analysis is a typology of six main paradigms (Chapter 4.3 and Table 4.1) and their sub-variations proposed as a framework to study plantations, that can serve as a theoretical and analytical tool in plantation research. The paradigms are classified as the i) preindustrial; ii) industrial colonial and industrial national; iii) protective; iv) social; v) neo-liberal and neo-liberal modified and vi) global political.

The second specific objective focused on providing direct insights on the micro-level of forest plantation practices and socio-economic and environmental realities. The empirical analysis of seven case studies presented in Chapter 5 illustrates different possible paths for forest plantations. The MCA evaluation warns against visible shortcomings presented in plantations organized under different paradigms and sheds light on positive effects that certain plantation paradigms may have. It points to paradigms that correlate with land conflict, shows how local involvement in different plantation types looks like, illustrates benefits that plantations are bringing for different stakeholders. The MCA analysis of the case studies assessed the economic performance of plantations and differentiated between profitability and benefit distribution, market access and the general environment for investments. It looked at the social issues as

diversified as work safety, access to services, participation or human resources situation. Also various environmental issues were tackled by the study, with land use change, water or soil impacts, habitat function etc. As the comparative case study showed (Chapter 5.3) the neoliberal modified paradigm (out-grower schemes) was the closest to the optimal plantation among the case studies (scoring totally 77% from the maximum of 100% that could be achieved by the ideal typical plantation, with a particularly high performance in social indicators resulting with a 90% score and very high economic performance of 84%). But other cases also showed particular strengths in the analyzed clusters and can provide interesting lessons, direct best practices were discussed in detail in Section 8.2.

The third objective was to link the macro diagnosis with the case study analysis to provide theoretical insights on the organization of plantations. This analytical part of the study in Chapter 6 focused on the assessment of different plantation types and on the applicability of the theoretical constructs. It showed that the paradigms are generally well reflected on the local level but there are always local particularities that can lead to some partly divergent performance. The global political paradigm, analysis showed, was clearly stronger as a political discourse in the macro analysis but weak in the actual application on the plantation level. This may be a result of the incoherence of the paradigm as a construct that results in the poor implementation. It may be also a result of the relatively small experience of such plantations and lack of time needed for such projects to realize their assumed goals.

Further, the study ought to organize the findings under the learning model and produce a set of 'lessons learned' from the different paradigms and from the case studies. This was achieved at different levels. Chapter 8 presented lessons from the paradigm analysis and from the case studies, further divided into recommendations for Paraguay and Indonesia in shaping their national policies regarding plantations as well in lessons at the plantation level (Figure 8.1). Lessons from the paradigm analysis provide important reflections on the role of the forestry community in shaping the future of forest plantations and identify the need to increase adaptive capacity of the field to shape better forest plantation policies in the future. They point to interdisciplinary exchange and inter-sectorial coalitions, need for rigorous evidence gathering to learn from plantation successes and failures. Finally, they show how the paradigm plurality may be used as an opportunity for learning and stress the need for transparency and synergies in creation of plantation related institutions and standards.

Universal lessons at the plantation level deal with resolving land issues, enhancing participation in plantation management, supporting local and national benefits, promoting inclusive governance and diversified sources of knowledge, assuring high growth rates and good work safety, taking into account broader investment environments, the role of rotation lengths and local institutional as social capital storage (Section 8.2.3).

Finally, the study of the plantation sectors in Paraguay and in Indonesia supported with direct case studies of plantations sheds important light on the *status quo* and possible future of plantations in both countries (Chapters 8.2). Recommendations for Paraguay and Indonesia focus on the forestry, institutional, political and sectorial aspects (Tables 8.2 and 8.3).

Both, Paraguay and Indonesia intend to greatly expand their plantation sectors in the future but there is little evidence that they would take into account lessons from the past. Critical attention is directed to Indonesia's hastily formulated and ambitious government programs for expanding large scale Industrial Timber Plantations (*Hutan Tanaman Industri* – HTI) and Community Timber Plantations (*Hutan Tanaman Rakyat* – HTR) schemes (FAO 2001). Also private companies managing large plantation areas receive much critical attention. Plantations replaced valuable lands and the private sector managed to vertically integrate pulp and paper production processes from plantation establishment and maintenance, transport, processing and marketing of the final product. Plantations in this scheme are often undervalued and profits are made on further links in the value added chain, detached from the initial environmental and social costs.

Forest plantations in Paraguay can be regarded as critically needed to fill the resource gap and offer the necessary wood products at the local and national markets, as well as adding to the development of the national economy through raw material or wood product exports. They are also necessary to reduce pressure on little that is left from the original Atlantic Forest. Yet corporate plantation investments are limited, despite attractive internal rates of return exceeding 15%. This is a result of political and commercial uncertainties, the possibility of expropriation, risk of violent conflict and transfer risks, corruption, poor infrastructure, bureaucracy and lack of confidence (Cubbage *et al.* 2010b). Institutional factors matter greatly in plantations development, due to the length of this investment. Nonetheless plantation investments by companies and communities are becoming more common. Plantation initiatives, especially grassroots smallholder plantations, are an important land use pattern for rural Paraguay

(Grossman 2012, Monges Zalazar *et al.* 2012, 2013). Smallholder plantations are also an important tool for addressing other major problems in rural Paraguay, such as livelihood diversification (Ellis 1998), reduced labor availability on farm (plantations are less labor absorbing than agriculture), or mitigation and adaptation to environmental uncertainties (Finnis *et al.* 2012).

Lastly the study indicates further research gaps and the way to proceed with studying the political economy of tropical forest plantations (Section 8.5). They are classified at three levels (global, national and local) and in three different epistemological contexts (theoretical, applied and methodological).

As this study shows, plantations are not equal and their particular impact is always a function of their strengths and weaknesses, which in turn result from the political economic factors and the paradigms that shape them. With the expansion of the sector and keeping in mind the complex role plantations have to play, it is essential to further look for macro trends and theoretical concepts and to study the political economic aspects of plantations. This monograph indicates that inductive social scientific research in forestry is necessary and possible to fill the existing research gaps. And for this work to become relevant and applicable it is highly important to bridge it to the forestry practices and local realities, combine macro analysis with local evidence. Even if the number of case studies provided in this book is marginal to the scale of plantation efforts in the tropics and subtropics, a careful case selection illustrates a big diversity in tree planting related to the various paradigms in plantation forestry.

A good understanding and diagnosis of global plantation developments and *status quo* is crucial for action and shaping plantation politics of the future. Therefore lessons presented in this research go far beyond traditional forestry issues and point to alternatives regarding social organization, land issues, distribution of economic benefits or environmental goods. Further investigation in the identified directions is necessary to continue learning from plantation paradigms, limit theoretical deficits in forestry research and lead to a more proactive role of the discipline of forestry in adding a broader socio-economic and environmental component to the trees.

## **8.4 OUTLOOK: THE FUTURE POLITICAL ECONOMY OF TROPICAL FOREST PLANTATIONS**

In 2010 planted forests occupied around 7% of the global forest area covering about 264 million hectares (FAO 2010a). According to all scenarios (see: Chapter 3), a further rapid increase of the plantation sector is predicted in the future (ACPWP 2007). Regardless of the pace of plantation development and its geographical distribution in particular regions, most of the future wood supply, even in plywood and sawnwood industry, will come from plantations. And highly importantly from the political economy perspective, the rapid expansion of the plantation sector will mostly take place in the tropical and subtropical regions.

The anticipated future scale of plantations is huge, and yet, in the growingly populous developing countries, land is becoming an object of contention and social unrest. Managing conflicts over land will thus be a major challenge for plantation development and governance. The problem, as this and other studies (Gerber and Martinez-Alier 2009, Gerber 2010) have shown, is not pressing under the social paradigm, but in large scale plantations it is frequent. It points to the future importance of out-grower schemes, under both the neo-liberal modified and a revised industrial national paradigm (which will most likely become even more similar, maintaining only different ownership and management structures).

Another problem that the paradigm analysis shows is how centralized governing affects the organization of plantations. Huge monoculture plantations stretched over tens or hundreds of kilometers not only breed social conflicts but also environmental problems. The research presented here shows that plantations showing a most balanced performance in economic, social and environmental terms are planned from a landscape perspective and in accord with the principles of integrated land use approach (FAO 1995).

As could be seen in Chapter 3 and Chapter 4, however, silvicultural knowledge as well as development experiences are not the sole drivers of plantation politics. The global epistemic community of specialists is divided. The current fragmentation of the plantation discourse is appalling. It leads to the decrease in coherence of the new global political paradigm, where plantations are perceived as temporary, short-term projects (cf. Chapter 4). The visible demise

of the CDM mechanism, which never really gained a momentum in plantation forestry, and the uncertainties regarding the REDD undermine the global governance arrangements important to the forestry field under the concept of ‘carbon forestry’.

Most of the growth in pulp and paper production is today occurring in “emerging economies” – that is especially the so called BRICS countries (Brazil, Russia, India, China and South Africa) as well as Indonesia. Although still underrepresented in the top 100 list (PricewaterhouseCoopers 2012), the “Third World MNCs” are making their way up the pulp and paper production rankings, and expand at much faster pace than their counterparts from developed economies. The demand for paper products is expected to rise continuously, and fast growing monoculture plantations in the tropics will be a major tool to satisfy it. In the future the Chinese market will be forced to import wood products, especially pulp. Between 2001 and 2007, the country’s exports of forest and paper products rose eight times (Dauvergne and Lister 2001: 81). This raises the question of the enforceability of global plantation forestry standards. It is uncertain whether the Chinese market, with its growing demand leverage, will be comparably strict on the norms of sustainable forest management, certification etc. as the Northern markets have become, and what will be the impact of this on the way plantations are organized and managed especially in South-East Asian producing countries. It was estimated that in 2007, 55-65% of China’s imports of wood from Indonesia came from illegal sources (Global Timber 2014).

This calls for continuous reflection on the changing political economy of forest plantations, and the last section lists possible further steps for this research agenda.

## **8.5 NEXT STEPS – IDENTIFYING FURTHER RESEARCH GAPS AND DIRECTIONS**

The analysis presented in this study point to several important study directions that should guide relevant plantation research. They can be categorized as follows:

- *At the theoretical, meta-level globally:* Further reflections on the current paradigm plurality in plantations and the future paths, research on international organizations (FAO, WB,

ILO), international conventions and negotiations (UNFCCC, UNCBD, UNCCD, IPF/IFF/UNFF) and their role and engagement in plantation politics

- *Applied on the global level:* A database on plantation case studies from around the world. The UNFF inter-sessional expert meeting in New Zealand in 2003 recommended an information pool regarding the success and challenges of planted forests as an accessible database of plantation case studies (UNFF 2003: 9). The database should provide data regarding plantations that would be more detailed than FAO FRA assessments. It should not only list global statistics regarding plantation area, actors, species and plantation products but possibly information on accidents, participation, employment on plantations, MAI, IRR, use of GMOs, chemicals, certification etc.
- *Single country level:* Theory-driven historical analysis of the plantation sector, reflections on their path-dependency, collecting both failures and best practices, guiding better national policies
- *At the local level:* Conducting comparative assessments of plantation case studies regarding their social, economic and ecological impacts, looking for innovation and best practices in plantation establishment and management
- *Methodological level:* Developing better frameworks for MCA of plantation case studies, with reliable indicators and comparative assessment tools, important for the academia, certification and auditing. There is a pressing need for more quantitative studies including economic and social feasibility, concentrating on financial, economic and social indicators. An example of the existing research gap is focus on labor qualification and availability in forest plantations

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## Annex to Chapter 3

This appendix complement Chapter 3 with a discussion of historical global plantation trends according to the dominating species.

### 3.1 HISTORICAL GLOBAL DEVELOPMENT WITH A FOCUS ON PLANTATION SPECIES

The composition of plantation species changed over time. Although different species match particular site characteristics and are often related to the geographical location, it is worth noting that four species have been particularly successful globally. Today, most of the tropical plantations consist of species of *Tectona*, *Eucalyptus*, *Acacia* and *Pinus* and are mostly planted as exotics (Evans and Turnbull 2009: 112). But the species selection and composition was a process of change reflecting the demand for certain wood, its usages and the silvicultural knowledge.

#### *Teak*

Already in 1650 in Indonesia, the Dutch colonists were carrying experimental teak plantations. Teak trial plots followed in many countries due to its high timber quality, good growth, market demand and domestication ease. From the 1850s teak was widely planted throughout the tropics. It was successfully established as an exotic species in many countries as Sri Lanka, Bangladesh and China in Asia; Ghana, Nigeria, Ivory Coast, Senegal, Togo and Benin in West Africa; Sudan and Tanzania in East Africa; Trinidad, Puerto Rico and Panama in Central America; Brazil and Ecuador in South America (Kaosa-ard 1995). Teak was found to be superior to European oak and became especially successful in ship building. Later on, other successful species overtook the lead in tropical plantations. Teak, as high value hardwood, was gradually overrun by fast-growing species. Keogh (1994) reported that the proportion of teak to overall plantation in the tropics dropped in relation to the other species; a share downfall from 11 % in 1980 to 5 % in 1990 is illustrating this trend (in: Kaosa-ard 1995). Currently more than 90% of teak plantations are located in Asia (Indonesia, India, Thailand, Bangladesh, Myanmar and Sri Lanka). Other significant areas are in South America (Costa Rica, Trinidad

and Tobago) and Africa (Nigeria, Cote D'Ivoire, Sudan, Ghana, Togo and Benin) (Keogh 1996 in: Odoom 2001). Although teak is turning relatively unimportant in terms of global quantity, its quality places it on the luxury market for furniture and decoration, and makes it very important in economic terms.

### ***Eucalyptus***

Eucalyptus' potential was explored later than teak, but it soon became the next leading colonial tree. At the end of the 18th and beginning of the 19th centuries, with European settlements in Australia, first species were explored and named. The first collection took place during an expedition by English naturalists Joseph Banks and Daniel Solander, with Captain James Cook in 1770 (Spirko 2010). Due to its multiple uses (medicine, lumber, charcoal, sawmill, pulp and paper) as well as its growth potential Eucalyptus became a favored plantation species in many tropical areas worldwide. It was introduced to South America at the beginning of the 19th century, with records from 1823 in Chile and 1825 in Brazil (Evans 2009: 10). In the period between 1905 and 1912 scholars talk about the Eucalyptus 'boom' (Santos in: Spirko 2010). It spread particularly in South America (Brazil, Uruguay) and Africa (Ethiopia, South Africa). Next boom can be observed in the 1980s when Eucalyptus potential for biomass production has been promoted. Used for large scale industrial plantations Eucalyptus became the mostly planted species in the world.

### ***Acacia***

Between 1920 and 1930, Australian black wattle (common name for a number of species of Acacia found in Australia, including *Acacia auriculiformis*, *Acacia crassicarpa*, *Acacia mangium*, *Acacia mearnsii* or *Acacia melanoxylon*) was extensively propagated by the private sector for tan bark supplying tannin for the leather industry (Evans and Turnbull 2009: 27). It was planted in Africa (South Africa, Kenya, Zimbabwe and Tanzania), Asia (India) and South America (Brazil) (Ibidem). Apart from tannin, wood properties for charcoal and paper pulp are important reasons for planting. Extensive planting of *Acacia mangium*, one of the major fast-growing species for pulp and other wood products, occurred throughout Asia, the Pacific and humid tropics in general.

### ***Pine***

In the 1960s it can be observed that the planting focus shifted from high-grade hardwood plantations to softwood plantations (predominantly pine) for the pulp and paper industry

(Odoom 2001). And so the dominant hardwood plantations of genus Eucalyptus, Acacia and Teak were more and more often accompanied by softwood plantations. However, Pines were not commonly planted before 1900 (Evans: in Evans 2009a). First Pines (*Pinus spp.*) were planted in South America in 1884. In 1877 *Pinus patula* was introduced to New Zealand and only in 1907 to South Africa (Ibidem). An afforestation project conducted in South Africa with *Pinus patula* during the 1920s turned very promising and led to other Pine-based programmes (Bass 1992: 62). *Pinus caribaea*, now widely planted in the tropics, was little known botanically and propagated until 60 or 70 years ago. The lack of records of early introduction of Pines maybe due to the fact that many quickly failed because of the lack of suitable mycorrhizas on the new sites (Evans 2009a: 10). Extensive plantations of Pines were the result of industrial wood needs, mainly pulp. First plantation designed for pulp was started in 1950s in Swaziland and it was using mainly *Pinus patula* (Bass 1992: 62). Five species (*Pinus caribaea*, *Pinus elliotti*, *Pinus oocarpa*, *Pinus patula* and *Pinus radiata*) are indigenous to central and north America and two (*Pinus kesiya* and *Pinus merkusii*) are from the Asian region (Pandey 1995). Very large, commercial Pine plantations were initiated during the 1950s/1960s in Chile, South Africa and New Zealand using *Pinus radiata* (Bass 1992: 62). In 1990 most of the Pine plantations were situated in Latin America (Brazil) and Asia (Indonesia, Vietnam and Thailand) and some areas in Africa (Sothorn Africa and Madagascar) (Ibidem).

## Annex to Chapter 4

This appendix presents details from the qualitative analysis of two historical sources in the paradigm delimitation process. Based on this inductive research and historical analysis of plantation developments and milestones, the typology of plantation forestry paradigms was derived. The first section presents an analysis of thirteen meetings of the foresters' epistemic community – the World Forestry Congresses, tracing the changing definitions, roles and approaches of plantations over time (*diachronically*). The second section presents the systematized results of a content analysis conducted on one of the discipline's major journals – *Unasylva*. In four “snapshots” (*synchronically*), changes of meaning around the concept of plantations are analyzed. Special emphasis is given to the changes in core paradigm indicators presented in the methodological chapter (Figure 2.2) that enable the inductive categorization of paradigms presented in the Table 4.1.

### 4.1 WORD FORESTRY CONGRESSES 1926-2009:

#### SNAPSHOTS ON KEY ISSUES IN FORESTRY, TROPICAL FORESTRY AND PLANTATIONS

*(...) the increasingly international nature of forestry is not confined to money and products but - first of all, I would say - is a matter of men and ideas.*

Don Francisco Ortunño Medina (Unasylva 1966)

As the president of the Sixth World Forestry Congress (WFC) stated in his speech, the boundaries of the discipline and approaches in forestry are significantly subjected to human perceptions, expectations and ideas. The WFC gatherings, mostly in six-year intervals since 1926, constitute a very interesting sample material to analyze this ideational spectrum of human conceptualizations of forestry at large, as well as plantation forestry in the tropics in particular. Analysis and interpretations of the congress materials reveal the attitudes of the core *epistemic community* to the role of forestry, tropical forestry and plantations. The thirteen WFC summaries provided below, on the one hand, reflect the trends and ideas towards forestry typical for the given periods. On the other hand, the meetings became increasingly renowned and shaped national policies and attitudes and experience exchanges in the field. They are *prestigious events [which] produce high quality papers, are recognized for their insightful deliberations and are known for*



*reaching broad consensus on authoritative, although not binding, policy and technical advice to governments and international organizations* (FAO 2010b: no pagination).

The first Congress organized in Italy in 1926 paved the way to regular international gatherings, which after the establishment of FAO in 1945, were always coordinated by the host with institutional, technical and logistical support coming from this organization. Due to the Second World War and its repercussions the first meetings have been irregular but from the 1950s turned to be a regular Congress held every six years. This relatively long timeframe between the events gives the World Congress importance, time for preparations and reflections. Six years, as will be shown in the analysis, brings significant changes in the forestry sector and in the “outside world”.

The first World Forestry Congress in Rome, bringing delegates from fifty-eight countries, was a breaking point for the development of international cooperation in forestry. The strongest delegations originated, not surprisingly, from most of the European countries and the United States of America. The presidents of the Congress were Italians. The vice-presidents were from Germany, United States, Great Britain, Dutch East Indies, Japan and Norway, and the presidents of the sections from Sweden, Czechoslovakia, Spain, France, and Brazil (Nature 1926: 30). The knowledge and expertise source in the global plantation discourse was therefore based on Northern/ European scientific forestry. For the working purposes, the agenda was divided into 5 working sections. Much focus was put on forestry policy, timber industry and technical silvicultural problems. In Section IV *A reafforestation* (original spelling - JS)<sup>39</sup> of the mountain areas was discussed as a protection mechanism what can be seen as a still marginal interest towards plantations. Regarding tropical forests, Section IV B concentrated on the research in tropical forests and the role of export of the tropical timber (Ibidem). Export earnings from tropical timber were seen as bringing progress and development. It is clear that during the first international meeting tropical forestry was underrepresented and so subordinated on the agenda, being a facultative subsection of panel IV. The first Congress illustrates certain characteristics of the paradigm indicators: it shows the dominant role of state authorities in forestry (crucial in management issues, governance, finance) and the prevalence of the colonial discourse. Knowledge and expertise are concentrated in the Northern/Western forestry representatives, land issues around the world are also treated in the Western-centric mode with exclusive ownership rights.

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<sup>39</sup> Here meaning a process of conversion again into forest. Today afforestation and reforestation are distinguished following the FAO definitions.

WFC	Key Issues for Paradigm Categorization
I WFC: 1926, Italy	<ul style="list-style-type: none"> <li>▪ State authorities dominant (crucial in management issues, governance, finance)</li> <li>▪ Colonial dependence in resource management</li> <li>▪ Northern/Western forestry domination</li> <li>▪ Land issues mirror the Northern/Western model</li> <li>▪ Export of tropical timber equals progress and development</li> </ul>
II WFC: 1936, Hungary	<ul style="list-style-type: none"> <li>▪ No significant changes in the paradigm indicators</li> </ul>
III WFC: 1949, Finland	<ul style="list-style-type: none"> <li>▪ No significant changes in the paradigm indicators</li> </ul>
IV WFC: 1954, India	<ul style="list-style-type: none"> <li>▪ Newly independent states see plantations as important to national development</li> <li>▪ Power shift but new postcolonial elites in the field are inherited from the colonial period or educated abroad; previous conceptualizations &amp; knowledge sources prevail</li> <li>▪ Interest in developing pulp and paper sectors, state incentives</li> </ul>
V WFC: 1960, USA	<ul style="list-style-type: none"> <li>▪ Focus on the "Multiple Use of Forest and Associated Lands"; five major uses are: wood, water, forage, recreation and wildlife</li> <li>▪ Global recognition towards protective plantations that are necessary on a mass scale</li> <li>▪ National authorities still the main actors</li> </ul>
VI WFC: 1966, Spain	<ul style="list-style-type: none"> <li>▪ Central issue "the Role of Forestry in the Changing World Economy"</li> <li>▪ Industrial and protective plantation discourse</li> <li>▪ Emphasis on industrial plantations</li> </ul>
VII WFC: 1972, Argentina	<ul style="list-style-type: none"> <li>▪ Main issue: "Forests and Socioeconomic Development"</li> <li>▪ New emphasis on social issues, role of wealth redistribution</li> <li>▪ Empowerment of new actors from the local level (smallholders, communities)</li> <li>▪ Technology adaptation</li> <li>▪ Promoting participation</li> <li>▪ Local knowledge rediscovered</li> </ul>
VIII WFC: 1978, Indonesia	<ul style="list-style-type: none"> <li>▪ Theme: "Forests for People"; stressing the role of timber and forest products in the local communities</li> <li>▪ Social components started in Argentina and still dominate on the Indonesian agenda</li> </ul>
IX WFC: 1985, Mexico	<ul style="list-style-type: none"> <li>▪ Theme: "Forest Resources and the Integral Development of Society"</li> <li>▪ Calls for a joint participation by the public and private and social sectors in forestry activities</li> <li>▪ Private capital encouraged in fast growing plantations</li> </ul>
X WFC: 1991, France	<ul style="list-style-type: none"> <li>▪ Theme of "Forests, a Heritage for the Future", rational use of forest in sustainable development today and in the future</li> <li>▪ Increasing complexity of forestry issues, need for flexible site-specific solutions</li> </ul>
XI WFC: 1997, Turkey	<ul style="list-style-type: none"> <li>▪ "Forestry for Sustainable Development: towards the Twenty-First Century" as the motto</li> <li>▪ Flexible arrangements (public-private partnerships or other schemes)</li> <li>▪ More participatory approaches in private business</li> <li>▪ Possible new land arrangements, new decision-making schemes, consideration of local knowledge and multiple-goal approach</li> </ul>
XII WFC: 2003, Canada	<ul style="list-style-type: none"> <li>▪ General theme "Forests, Source of Life"</li> <li>▪ Plantation discourse is very polarized and divided into different streams</li> </ul>
XIII WFC: 2009, Argentina	<ul style="list-style-type: none"> <li>▪ Theme: "Forest Development: a Vital Balance" with focus on environmental, social and economic challenges</li> <li>▪ Further division of the plantation discourse</li> <li>▪ Very inclusive agenda, with a lot of debates on forestry vs. climate change</li> <li>▪ Promotion of project based management</li> <li>▪ Multi-sectorial scope and need for glocal knowledge (indigenous knowledge enriching global knowledge)</li> </ul>

**Table 4.1 (A)** - World Forestry Congresses 1926-2009, Summary of key issues for paradigm categorization. Own elaboration based on Nature 1926, Current Science 1936, Unasylva 1949, Unasylva 1954, Unasylva 1960a, Unasylva 1960b, Unasylva 1966, Unasylva 1972, FAO 1978, Unasylva 1985, Unasylva 1991, FAO 1991, Unasylva 1997a, Unasylva 1997b, FAO 2003, WFC 2009, WFC Bulletin 2003, WFC Bulletin 2009.

The following Congress, held in Budapest in 1936 had a similar scope and agenda as the one in Rome. The main issues were forestry statistics, policy, legislation, research, trade, wood science, silvicultural practices, soil protection, farming, tourism, with Tropical Forestry building an autonomous, yet still the last section - number IX (Current Science 1936: 837). It illustrates analogical paradigm characteristics as the antecedent event.

The Third World Forestry Congress was initially planned for 1940 but had to be postponed because of the World War II. The representation was still uneven, with the lack of or only limited delegations from some countries with great significance to global forestry (not only because many large producers were still non-sovereign territories). The agenda was divided into “silvics and silviculture”, “forest surveys”, “forest economics including forest policy”, “forest utilization” and “forest industries”. One of the most important results of the debates held in Helsinki was the common recognition for the need to prepare a forestry dictionary in the major world’s languages. Another big issue with unanimous approval was to organize the future congress with special focus on tropical forests (Unasyuva 1949, XII WFC Bulletin 2003). Plantations were discussed to a limited extent. The report mentions reforestation activities in the host country – Finland (Unasyuva 1949). No significant changes in the paradigm indicators can be observed, important change can be related to the scope of forestry science in general and a broadening of the concept of forestry can be clearly observed:

“This idea is that the sciences and techniques of forestry should not be limited to the solution of silvicultural problems as ends in themselves. Closely bound up with "forests" as a whole, and even with each individual forest, there is a whole set of physical, economic, industrial, and social factors which must be taken into consideration. The relationship is so close that none of these factors can be considered independently, and together they form a new and broader concept of the term ‘forestry’” (Unasyuva 1949: no pagination).

As conceived in Finland, the next WFC was held on the Southern hemisphere, in India in 1954. The programme concentrated on the role and place of forested areas in the general land economy and economic development (Unasyuva 1954). Apart from sections on protective and productive functions of the forests, an independent section was called tropical forestry. It dealt with methods of increasing growth and obtaining natural regeneration (particularly teak, tropical forest, mangrove, bamboo, and pine), techniques of artificial regeneration and plantation formation, desert control, shifting cultivation, inventories in tropical forests and methods of research (Ibidem). One of the crucial subject matters was the development of pulp and paper industries throughout the world. Much interest was shown to those countries with

prospects for pulp and paper manufacture. Participants recommended plantations under tropical conditions in pure softwood or hardwood stands to achieve continuous raw material supply to proposed new pulp mills. The Fourth Congress illustrates the changing thinking in forestry and India's role as a host is a good example of this change. New independent states in the tropics and subtropics portrayed the plantation sector as an important tool to development and introduced fiscal and land incentives for plantation establishment.

The meeting held in 1960 in Seattle promoted a new approach to forest management called "The Multiple Use of Forest and Associated Lands". This meant conserving resources while compromising five major forest uses, namely for wood, water, forage, recreation, and wildlife (Unasylva 1960a). It clearly implies that the agenda was no longer dedicated to technical issues regarding forest utilization, but to a broader concept of land development and use of its resources. It showed a global recognition towards protective plantations that were necessary on a mass scale and should be complementary to industrial plantations. Here the national authorities were important actors to define and coordinate such plantation efforts. Main topics during the Fifth World Forestry Congress were divided into ten sections with silviculture and management, forest protection, education, forests and range watersheds, forest operations and logging, genetics and tree improvement, forest economics and policy, forest products, forest recreation and wildlife, and tropical forestry (Unasylva 1960b). The section on Silviculture and Management recommended to establish uniform procedures for recording data on experimental forest plantations and to study how long-term repeated plantations on the same land can be made efficiently. The section on Tropical Forestry tackled natural regeneration and planting in a "spirited discussion" where both types of regeneration were considered to be needed in many areas and not mutually exclusive (Ibidem).

The Sixth World Forestry Congress was organized in Madrid in 1966 under the motto "the role of forestry in the changing world economy" and was strongly affected by the FAO publications *World forest products statistics - a ten-year summary 1951-1963* and *World forest inventory 1963* (Unasylva 1966). It differed from the previous Congresses by taking a clearly international perspective motivated by the changes undergoing globally – population expansion, economic growth, scientific and technological developments and the growing inequalities between nations separated by economic and political barriers (Ibidem). On the one hand, the Congress confirmed the huge international implications of forestry. On the other, it took a rather narrow industrial perspective. As stated by the Congress President, Don Francisco Ortunño Medina, in

his closing speech: “above all, we must produce cheaper timber (...) We are now convinced that our task is not so much one of preserving renewable sources but rather of developing them and improving their management” (Ibidem: no pagination). The four plenary sessions dealt with the world trends with wood resources, planning the use of forest potentials, the institutional framework for forestry development, and financing of forestry and forest industries development. Ten commissions were formed to discuss in groups the following subjects: tree improvement and afforestation; forest protection; forest management and silviculture; wood harvesting, logging and transport; the human factor in forestry; forest questions specific to tropical regions; forest industries; national parks, forest recreation and wildlife; forest influences; forest economics and statistics. The Congress in Madrid kept the industrial and protective plantation discourse but put emphasis on industrial plantations and technical solutions.

The agenda shows a big interest during the Sixth Congress in technical and economic issues and increase in the global timber supply. And this has a clear relation to the promotion of plantations, and investments in the tropics and subtropics, with a comparative advantage to provide timber resources in a short time. “The Congress affirmed that (...) additional supplies can be obtained by extending forest operations into yet unused areas; there are tremendous opportunities for raising productivity in areas presently in use and for establishing new plantation forests (...)” (Unasyuva 1966: no pagination). Important result of the Congress was also its statement to the Secretary General of the United Nations to study the members’ views on the encouragement to loans to finance forest plantations and industries in the developing countries by the Regional Development Banks (Unasyuva 1966).

The 7<sup>th</sup> WFC held in Buenos Aires in 1972 represents a big shift from the main discourse during the preceding meeting. Its key phrase: ‘forests and socioeconomic development’, illustrates well the emphasis which was mainly put on social priorities. The first such international gathering in Latin America brought some crucial changes and new arguments in debating global forestry issues. It is necessary to bear in mind, that this Congress took place soon after the important ideational shifts of 1968, bringing new political and social discourses to the fore (such as the nascent environmentalism and the New Left inspired interest in global development). What is more, Latin America of the early 1970s is the nest of radical *dependencia* theories of development. All this together accounts for the social context, which influenced visible change in approaches between the 1966 and the 1972 Congresses. The “wind of change” came also from the United Nations Conference on the Human Environment held in Stockholm some

months before the 7<sup>th</sup> WFC. “The wind of change blowing through the world has brought about a new consensus, and a declaration adopted in Buenos Aires is an attempt to give shape to that consensus (Unasylyva 1972: no pagination).” The declarations states that economic, social and environmental issues should be jointly recognized. The perspective on forest resources in Argentina turns into a global common responsibility, while before a macro perspective could be rather considered as international, meaning the sum of national approaches. As can be read in the report: “Since we live in one world, and since the forest resources of the world are unevenly distributed, national policies and plans must take account of the international context.”

The agenda adopted in Buenos Aires was differently organized than it used to be during the previous events. The seven experimental commissions were called: the Silviculturalists; the Professors, Teachers and Students; the Conservationists and Recreationists; the Loggers; the Researchers; the Economists, Administrators and Planners; the Industrialists; and Open Forum. The Congress brought a new emphasis on the social issues in forestry activities, including plantations. It stressed the role of wealth redistribution, empowerment of new actors from the local level (smallholders, communities), called for technology adaptation and participation. The dominant universal knowledge needs to be translated to the local conditions, local knowledge is no longer discouraged as unscientific but partially incorporated to the mainstream. The table below illustrates a major shift from technical universal solutions towards responsible approaches.

VI WFC Madrid 1966	VII WFC Buenos Aires 1972
Technocratic forestry	Responsible forestry
<i>We should take the new instruments offered by other disciplines and adapt them to the requirements of our work, but we should also defend what is essentially forestry, as well as our right to decide on matters concerning the biological entity formed by the forest. Closing speech by the president of the Congress, Francisco Ortunño Medina (Unasylyva 1966: no pagination).</i>	<i>The congress critically examined the status and responsibilities of the forestry profession. (...) Foresters recognize that forestry is concerned not with trees, but with how trees can serve people. The congress declares that the forester, being a citizen as well as a professional, has the clear duty and responsibility to ensure that his informed judgment is heard and understood at all levels of society. His allegiance is not to the resource, but to the rational management of that resource in the long-term interest of the community (Unasylyva 1972: no pagination).</i>

**Table 4.2 (A)** – Examples of the changing approaches regarding the role of forestry

Regarding the tropical forestry and plantations, the final declaration points to the rising inequalities between the developing and developed countries and sees the role of forests, including the big role of man-made forests, in bringing the socioeconomic development. It points to the necessity of research and collaboration, role of properly managed institutions and

aid provision. A big shift in understanding of forestry and goals of forestry activities, including plantations, could be observed between the VII WFC and its predecessor. While in Madrid the Congress documents included statements on the autonomy of forestry science and its clear boundaries, the Buenos Aires declaration goes very far into the ethical responsibility and more Max Weber-inspired *vocation* in forestry.

The context for the 8<sup>th</sup> World Forestry Congress in Jakarta in 1978 was influenced by the oil crisis of 1973. Despite significant attention paid to energy shortages, the Congress' theme was „Forest for People“ and focused broadly on how forestry may serve humans, individually and collectively (FAO 1978). The major concern of the gathering was for the tropics, with discussions on the “poor man's energy crisis” with growing firewood shortage and the alarming disappearance of tropical forests. Plantations are here no longer perceived as an option, but rather as a necessity to fill the gap between the world's needs and capacity of its forests. Large areas of successful plantations are therefore encouraged. The central issue of the people brought the debates particularly to the situation of the rural poor in the developing world. People were considered as a force for development and not its passive object (Ibidem). The role of forests in providing a range of goods and services, like influencing quality and quantity of water, improving conditions for agricultural production, erosion control, food production and animal fodder has been widely recognized. Some new issues appear in the official declaration of the Congress – mainly forest workers labor conditions, gender issues, or the long perspective with focus on future generations. The social components empowered in the previous event hold in Indonesia as a strong discourse of the 1970s.

1985 has been proclaimed as the International Year of the Forest and it can be observed that the forest issues have been increasingly recognized as a global concern. During the 9<sup>th</sup> WFC organized in 1985 by Mexico, the main focus was on the theme statement “Forest Resources in the Integral Development of Society”. Despite the stabilization of the oil prices, the energy supply issue and the need for fuel wood and charcoal remains crucial for the forestry sector. It was noted by the FAO Director General, Edouard Saouma, that 80% of the wood used in developing countries goes for fuel wood and charcoal (Unasylva 1985). During the Congress the role of other sectors in forest policy was discussed and the need to assist in adequate national policies and incentives formulation was stressed. Plantations are commonly discussed in several different contexts. Firstly, protective tree-planting is widely acknowledged. Secondly, industrial, export oriented plantations of fast-growing trees are encouraged. Finally, the role of

plantations at the individual farm level and plantations of multi-purpose trees are widely promoted. This three discourses are based on public, private and social sectors in forestry activities. And a flow of private, often foreign capital, becomes increasingly common in plantation activities. The Prime Minister Ghandi said at FAO Conference that “the second Green Revolution would come when small farmers around the world systematically planted trees on their land” (Ibidem: no pagination). Tropical forests and the problem faced by the developing countries are still dominating the agenda. Forestry’s role in rural development is widely discussed, as the institutional necessities in shaping forest policies. It is stressed that local people must be widely incorporated in the decision-making schemes. FAO Director General mentioned the importance of growth of hundreds of NGOs concerned with many aspects of forest development (fuelwood, wildlife, rural development, environmental protection etc.). In the context of the industrialized countries, big attention was paid to the threat of acid rain (Ibidem).

The Tenth World Forestry Congress scheduled for Paris in 1991 responded to the global debate on sustainable development and took the motto “Forests, a Heritage for the Future”, meaning the need for a rational use of forest resources in sustainable development, meeting the current needs of people living on the planet, but also of future generations. Main discussion areas of the Congress were no longer organized along single issues or recipient groups, neither according to geographic divisions. They rather build complex, interdisciplinary issues as the sample discussion areas “trees and forests in rural and urban land management” or “the forest heritage, an economic resource” (Unasyuva 1991). The final declaration recommends people participation, long-term land management planning, designation of protected zones, appropriate silvicultural techniques (with reference to absorption of carbon dioxide) and finally that “agroforestry systems, afforestation and reforestation be developed more actively” (FAO 1991). As stated by the FAO Director General “support to tree-planting activities will remain a high priority for FAO” (Unasyuva 1991). In the context of tropical forestry, big hopes are combined with the launched Tropical Forestry Action Plan. The Director General stressed the role of increasing awareness, role of women, increasing participation, traditional knowledge, and the role of NGOs in the conservation and sustained development of forest resources (Ibidem). Interestingly the same Director General, Edouard Saouma, referred in the 9<sup>th</sup> Congress to “literally hundreds of NGOs” while in his interview at the 10<sup>th</sup> Congress to “literally thousands of NGOs”, the shift of one full range, denoting an important factor in modern forest politics. In the same interview he suggested FAO efforts to bring an instrument



to all types of forests and indicates that it would be however non-binding and recognizing the sovereign right of each nation. At this time formulation of other global and additionally binding regulations (regarding biodiversity and climate change) is already ongoing and will affect and fragment the forest-related issues under different regimes.

“The interrelationship between forests, climatic stability and biodiversity cannot be denied, but these are only two of a myriad of “user-oriented” interests for which forests must be conserved and sustainably managed. In FAO’s view, a better way to deal with the challenges of forest management, conservation and development would be to take a “resource-based” approach that fuses ecological considerations with an appreciation of the economic importance of forest development and the significance of forests to local peoples” (Edouard Saouma in: Unasylva 1991: no pagination).

The Congress shows increasing complexity of the forestry issues and calls for flexible site-specific solutions.

The theme selected for the 11<sup>th</sup> WFC in Turkey was “Forestry for Sustainable Development: towards the Twenty-First Century”. Again, as in the last gatherings forestry is perceived not as an isolated, purely technical discipline, but rather as “an important component to overall socio-economic development” (Unasylva 1997a). The call<sup>40</sup> number twelve is very important for the plantation discourse, as it calls “countries and international organizations to recognize that, in many regions of the world, *fast-growing tree plantations* can contribute to sustainable management of forests by meeting subsistence needs and can complement, and/or reduce the pressure on, natural forests through increased supply of forest goods and services” (Unasylva 1997b: no pagination). In the context of tropical forestry capacity building, technology transfer and encouragement for public-private partnerships were discussed in call number four (Ibidem). It can be seen as a new approach to the previous paradigm indicators. Flexible arrangements such as public-private partnerships or other schemes change the hierarchical governance structures within the private business towards more participatory approaches. It may lead to new land arrangements, new decision-making schemes, consideration of local knowledge and leaving the pure productivity maximization approach to a multiple-goal scenario. The Antalya declaration also asks for methodologies for valuing forest goods and services, development of specific criteria and indicators and voluntary codes contributing to Sustainable Forest Management. An important change which can be observable for the Congress in Antalya is that the forestry epistemic community engages more in providing technical responses to the political

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<sup>40</sup> The “recommendations” from previous Congresses were replaced by “calls”. This linguistic intervention reflects the urgency to take action in taking into account the Congress’ findings.

issues. So the Congress refers to many initiatives and has a follow-up in the Intergovernmental Panel on Forests, in the sessions of the Commission on Sustainable Development or during the UN General Assembly meetings (Unasylva 1997a).

The 12<sup>th</sup> Congress was held in 2003 in Quebec, Canada, with a general theme “Forests, Source of Life”. Its proceedings were divided into the following areas: Forests for People, Forests for Planet, and Forests and People in Harmony (WFC Bulletin 2003). Plantations have been discussed in all the distinguished areas. The final statement of the Congress states the importance of planted forests and trees outside of the forests while calling to “(...) promote planted forests and planting of trees outside forest systems, including in urban areas, which make a contribution to sustainable development” (FAO 2003). During the panels plantations lead to some controversies and there was a more critical debate on plantations’ benefits (fuel production, carbon sequestration, desertification control, land rehabilitation, employment) and negative impacts (monocultures, conflicts with customary ownership, loss of medicinal plants, soil degradation) (XII WFC Bulletin 2003). In the tropical forestry context, the final statement enumerates some issues as the role of youth in pursuing sustainable forest management, need for more effective partnerships and governance frameworks, need for interdisciplinary dimensions in research, adding value to forest goods, and monitoring (FAO 2003). But compared to some other final declarations, it is vague and not innovative. What can be concluded regarding the agenda, is that the environmental discourses are more represented compared to the previous meetings, and a separate panel on climate change was held. Additionally, governance was a new topic during the Congress, with a focus on corruption, legality and modes of good and bad governance. This attention is further reflected in such processes as Forest Law Enforcement and Governance and Forest Law Enforcement, Governance and Trade (Savenije and van Dijk 2010: 80). It is clear that the plantation discourse is very polarized and divided into different argumentation lines.

The most recent 13<sup>th</sup> World Forestry Congress was held in 2009 in Buenos Aires under the theme “Forest Development: a Vital Balance” with an inclusive agenda combining environmental, social and economic challenges, open for a multi-sectorial scope and local-global knowledge dialogue. For the first time the Congress incorporated discussion fora, business meetings and a communication session (WFC 2009). After many years of distance, the Congress moved closer to the forest industry sector while looking for potentials of clean technologies (Ibidem). The Congress held in Buenos Aires had a strong focus on the issue of

climate change in forestry, where CDM and REDD have been heatedly discussed. It is noted that while “the topic of forests and climate had little visibility in 2003 and hardly any role at the XII WFC” in 2009 “it was of the greatest interest, attracting the largest audiences” (Savanije and van Dijk 2010: 67). The climate change debate is said to detach attention from the previously highly ranked issues such as community and social forestry promoting participation in forest management, thus taking attention “from the people to the planet”, so to speak. Apart from a typical end declaration, it also prepared a draft message to the UNFCCC Conference of the Parties 15. Plantations and planted forests were widely discussed in various panels and there was a separate agenda on “planted forests”. The final declaration, as the previous declarations, refers to the recognition of the importance of planted forests (WFC Bulletin 2009). The declaration stresses that planted forests are more effective in providing goods and services from less land and are important in climate change mitigation. Strategic actions towards plantations need to recognize their importance, focus on degraded landscapes and develop sound technologies (WFC 2009). Rubens Garlipp from the “planted forest” panel called them “a strategic vector of sustainable development” (WFC Bulletin 2009: 11). Mosaic plantations and investment constraints had been further discussed in the panel. Generally a further division of the plantation discourse can be observed, with a big attention to project management in plantations and their role in mitigating climate change. More controversies on plantations were raised in other sections, for example in relation to biodiversity and water retention. Similarly to plantations, the tropical forestry context was also much affected by the climate change debate, and tropical forests in general were recognized to play a critical role in climate change mitigation and adaptation measures. Certification, biodiversity conservation and sustainable tropical timber trade were other important issues in the debates.

Presented material is not only an illustration of the changes in the agenda of a cyclical international forestry summit. What is clearly visible from this data is the receptiveness of the international forestry epistemic community to socio-political processes on a global scale. The Congresses can be taken as a proxy of the ideational changes related to tropical forestry and plantations and are an important material for inductive research on paradigms in forest plantations. The analyzed material shows significant changes in the paradigm indicators occurring almost every decade. Chapter 8.1 discusses lessons learned for the forestry epistemic community to shape a better global plantation policy.

## 4.2 CHANGING PLANTATION DISCOURSE: A CONTENT ANALYSIS OF *UNASYLVA*

This section contains research which aims at tracing the shift of the usage of the terms *plantation/-s* and *planting* in *Unasyuva*, an International Journal of Forestry and Forest Industries established under the UN Food and Agriculture Organization (FAO) in 1947. Because of its long tradition the journal was used to provide several text samples to analyze plantation definitions and discourses. From 4 issues of about 100 pages each (with a 20 year interval: 1947, 1967, 1987 and 2007), all passages including the terms *plantation/-s* and *planting* were analyzed. For each issue all the appearances of the words *plantation/-s*, *planting* were counted and a specific context of each word has been coded. This is seen as another important indicator of the changing attitudes towards plantations, their understandings and goals.

### ***1947: Emerging internationalization and the faith in technology***

In the first issue of *Unasyuva* from 1947 plantations are mentioned 30 times, 28 definitions are used regarding the developed countries<sup>41</sup> and only 2 in relation to the developing world. So the predominant use of the term relates to the developed world, stressing mostly the need to plant trees after the losses in tree cover during the WW II.

The journal has definitely a global scope but does not use a global approach. It is organized on national basis with examples and reports on forest and plantation issues from different countries. Not only no generalizations follow the single country approach but no lessons or critical assessments are provided regarding plantations.

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<sup>41</sup> In this context the Communist Bloc countries, such as the Union of Soviet Socialist Republics, are treated as developed.

Volume / Issue / Year	Plantation/s planting appearance	Main Context and Key Issues for Paradigm Categorization
Volume 1, Issue 1, 1947	30	<ul style="list-style-type: none"> <li>▪ state-led programs and agencies, domination of state actors in plantations</li> <li>▪ pure top-down approach towards planting</li> <li>▪ visible colonial division</li> <li>▪ industrial focus</li> <li>▪ faith in technology and Western solutions</li> </ul>
Volume 21, Issue 84, 1967	33	<ul style="list-style-type: none"> <li>▪ new postcolonial actors in plantations</li> <li>▪ increase in plantation scale and productivity, land accumulation, ambitious plantation programs worldwide</li> <li>▪ industrial focus</li> <li>▪ faith in technology and Western solutions</li> <li>▪ beginning of some social elements (labor issues)</li> <li>▪ protective plantations as a separate category</li> </ul>
Volume 39, Issue 155, 1987	137	<ul style="list-style-type: none"> <li>▪ significant increase in plantation scale</li> <li>▪ states are no longer dominant actors, local communities and organizations, NGOs, networks with research institutions, private companies are all important players</li> <li>▪ top down approach meets the bottom up evidences</li> <li>▪ large scale plantations give some way to small projects with active participation</li> <li>▪ indigenous species and knowledge recognized</li> </ul>
Volume 58, Issue 226-227, 2007	64	<ul style="list-style-type: none"> <li>▪ broadening of plantation context</li> <li>▪ critical, self-reflective narratives</li> <li>▪ interdisciplinary research, complexity in plantation issues</li> <li>▪ case specific projects</li> </ul>

**Table 4.3 (A)** - Overview of the plantation discourse in four snapshots based on the Unasylva analysis (Source: own elaboration)

The overall spirit in the text samples is the strong belief in technology and research. Much attention is paid to the investigation of trial plots. Simultaneously, no social context follows the tree planting procedures. The actors mentioned with tree planting are state agencies and programs. Environmental context of plantations is visible but limited in scope (protection functions and plantations as the right tool to protect the natural forest).

As the example from the UK shows (trade-off between forest plantations and food production) dilemmas which today are widely discussed in the context of the developing world were also tackled in the recovering Europe in the late 1940s.

**Summary 1:**

- Plantations in developed countries: 28 times (93%) and developing countries: 2 times
- No term use in global context
- No term use in social context
- Very limited usage in environmental protection context (protection, countering the loss of natural forests)
- Plantations vs. food supply mentioned in the case of the UK
- Visible plantation efforts after the World War II
- State agencies and state programs often mentioned in plantation efforts
- Focus on technology and research need
- Much attention on planting investigations and trials

### ***1967: Ambitious plantation programs worldwide***

Although the term was used 33 times (compared to 30 times in the number from 1947), so there is no substantial difference with the absolute popularity of the term plantation, there are huge variations in the context of tree planting in 1947 and 1967.

First of all the term was used more often in relation to developing countries (19 times constituting 58% of all the uses compared with only 2 uses in 1947) and only 10 times (30%) for the developed countries. Also the global context gained importance with some truly global approaches and several country examples with generalization purpose. Even the single countries examples try to approach questions of global development, as in the Swaziland case study.

The economic narrative still predominates but a ‘seed’ for further social context can be observed, namely issues related to labor, manual work and training on plantations. Interestingly the cultural attribute of plantations is reflected by three uses of the term related to the forestry film festival. Additionally for the first time the term plantation appears in relation to some ethical dilemmas because of monocultures.

#### **Summary 2:**

- Slightly larger absolute number for the “plantation-” usage (33 times compared to 30 in 1947 piece) but much more differentiation in geographical scope and many new semantic attributes and associations compared to those in 1947
- In the context of developed countries the term was used only 10 times (30%) and it was predominantly used for developing countries 19 (58%) or in solely global context (12%)
- Even the lessons from the single countries try to approach the global context (as the Swaziland case study)
- Economic narrative is still dominant
- Social context concentrates on labor, manual work and training
- Cultural component of plantations, 3 uses of the term in the context of the forestry film festival
- Ethical dilemmas of plantations tackled by one use of the term
- Acknowledgement of the protective services of plantations
- Plantations as a tourism issue
- Ambitious plantations worldwide
- Private investments in plantations more popular, especially for quick growing species with high promises of good capital returns
- Faith in technology

The faith in technology is visible and predominates in the industrial plantations narrative. Role of private investors regarding plantations rises at the cost of the state dominance present 20 years earlier. Ambitious plantations worldwide are discussed in relation to good capital returns, especially quick growing species. The associations for the term are broader; plantations are also

considered in terms of further services (especially protection) and because of their tourism value.

### ***1987: Plantations on a mass scale***

An enormous growth in the use of the term in this issue of *Unasylva* can be observed – 137 times compared to 30 and 33 in the samples from 1947 and 1967 respectively. Such plantation fever can be referred to the massive plantation scale and illustrates the critical thinking about plantation planning and management in the past. In this issue, similarly as the previous one, plantations are predominantly related to the global South (50% of the definitions). Still about 10% of the term use has a purely global context, but many single cases are opened for general conclusions.

Definitely the term *plantation* gains new contexts, attributes and associations and the journal tries to organize the articles according to one red thread, in this case – the urban forestry question. This may also explain the huge frequency of the use of the term *plantation* in this particular issue. Forestry and economics are no longer the main contexts for plantations. They go hand in hand with social aspects of planting trees. Critical discourses can be traced while describing plantation efforts, i.e. some ideas of justice and benefit sharing appear with emotionally-loaded phrases.

There is also a visible change of actors engaged in the plantation projects. In the issue from 1947 there were states, in 1967 state and private companies and in 1987 we read about local communities and organizations, NGOs, networks with research institutions. Large scale plantations give some way to small projects with active participation.

Cultural values of forests are widely recognized as their social role in income diversification. Forestry economics is an important narrative (for example for establishing cost benefit ratios for plantations and natural forests) but it is more nuanced (dependent on rates, context specific). Indigenous species are back on the agenda.

Issue	Developed country cases	Developing country cases	Worldwide
1947	11x USA, 11x Canada, 3x USSR, 1x UK, 2x Australia <b>28</b>	2x Kenya <b>2</b>	-
1967	Italy, Israel, Norway, Yougoslavia, 2x Denmark, 4x Spain <b>10</b>	Nepal, 11 x Swaziland, South Africa, 3x Algeria, 2x Cuba, Lebanon <b>19</b>	<b>4</b>
1987	3x Hong Kong, 2x USSR, 8x UK, Japan, 7x Singapore, Brussels, 7x Canada, 4x New Zealand, 19x US <b>52</b>	7x Uganda, 2x Uganda and Ethiopia, 3x Fiji, 21x Pacific, Karibati, Indonesia, 7 x Ethiopia, 4x Mexio, 7x China, <b>53</b>	<b>4</b>
2007	China (moved from 'developing' – JS) <b>1</b>	3x Brasil, Africa, 3x Lesotho, Capo Verde, El Salvador, Honduras, 3x Kenya, 7x Senegal, 3x Mali, 2x Cameroon, Guinea, 2x Sierra Leone, India, Indonesia, 3x Chile <b>34</b>	<b>29</b>

**Table 4.4 (A)** – Usages of the analyzed term in developed/developing/worldwide contexts  
(Source: own elaboration)

### Summary 3:

- Term analyzed is used 137 times compared to 30 and 33 in the two other studied issues
- Predominant use related to the developing countries (50%), less for developed countries (40%) and in the global general context (10%)
- Context for plantations developed from pure forestry and economics to multifaceted issue
- Visible shift towards social aspects of plantations, especially in the developing world
- Presence of critical discourses
- Wide recognition of the cultural value of planted trees
- New actors in plantations, local communities and organizations, NGOs, networks, academia
- Presence of small scale projects, active participation
- Distribution of income as an issue, recognition of income diversification need
- Propagating indigenous species
- Forestry economics
- Cost benefit ratios establishment for plantations and natural forests, natural forests cannot compete at high rates with alternatives

### *2007: Towards self-reflection*

In the issue from the year 2007 we observe exactly the reverse trend in geographical scope compared to the first issue studied (1947). Now absolutely the main attention is given to the plantations in the developing countries and to the general global conclusions. Case studies are not for their own sake but they are used for valid conclusions, comparisons and generalizations. The journal, in the 2007 celebrating its 60<sup>th</sup> anniversary, becomes self-reflective and historically self-aware. Lessons learned from the past start to become an issue for the academia. Also some practical advice can be read between the lines.



Critical thinking is more organized than 20 years earlier and positive alternatives for social organization and the role of tree planting are discussed and subsumed under interdisciplinary approaches. It is visible that finally the top down approach, which was dominant in the first issue and weakened in the subsequent, meets the bottom-up voices. Interviews from the ground levels start to reach the language of the international journal. Additionally global tools are proposed to meet the local goals (role of FAO and research).

**Summary 4:**

- Global scope, generalizations, examples from certain countries to support the argument or to compare the developments
- Self-reflection, historical analysis, lessons from past and failures discussed in the academia
- Practical advice
- Start for critical thinking and (though relatively weak, sporadically appearing) positive alternatives for social organization and the role of tree planting
- Interdisciplinary research, complex approaches towards plantations
- Top-down meets bottom-up approach
- Accepting voices from below and looking for global solutions (the role of FAO, research etc.)
- Much attention towards the role of women in plantation projects
- Local needs, culture and practices widely acknowledged
- Landscape approach gains importance
- Promotion of dialogue between stakeholders
- Role of adequate incentives from the state level
- Encouragement of small scale planting with diversified services for the local community

Interestingly many attributes to plantations in this issue are related to the role women play in the local communities. Plantations are very much associated with the local needs, culture and practices; they are important for integrated land use planning. Nevertheless acknowledging the interrelation between plantations, the economy, the environment and the local population is not enough to find adequate solutions for such complex issues. And this is still the gap in the articles, that the positive program is weak and fragmented.

Analysis of the journal clearly shows significant differences in plantation discourse. It is a useful tool in inductive paradigm research that shows the general ideational trends that are corresponding and complementary to the results of the World Forestry Congress analysis. Both sources complemented by historical facts and FAO archival documents allow to put the changing paradigm indicators into certain paradigm characteristics. While major changes in paradigm indicators are considered as paradigm change and emergence of a new paradigm, minor changes are seen as paradigm modification. A detailed classification with explanation of each paradigm, its historical background and reasons for changes are discussed in the Chapter 4.3 presenting the typology of plantation paradigms.

## Annex to Chapter 5

This Annex provides a summary of steps for the MCA and data used in the case study analysis (5.1), shows how the indicators were clustered (5.2) and final synthetic indices developed (5.3). Data collected in the field and the full normalization process with calculations and the correlation analysis are provided on a separate CD.

### 5.1 STEPS OF THE MCA ANALYSIS

- Data from the fieldwork questionnaires and expert interviews **underwent normalization in the 0-1 interval**
- Indicators have been clustered in categories, **clusters** represent the main plantation issues and are weighted equally (equal weights for indicators in clusters and equal weights for clusters in the final index)
- **Final synthetic index** elaborated for each plantation in three categories: social, economic and environmental performance
- Visualization of the results on **radar diagrams** for each plantation case study (Figures 5.1 and 5.2)
- Radar diagrams show the **gaps from the single value to the ideal value** (distance from the ideal is the reference point)

#### 5.1.1 Data normalization table

Case study	Case Study I Smallholder Plantation with PMRN	Case Study II Smallholder Plantation with CDM	Case Study III Smallholder out-grower schemes	Case Study IV Enterprise POMERA	Case Study V Smallholder Community Plantation APHR	Case Study VI State enterprise Perum Perhutani	Case Study VII Enterprise MHP
SOCIAL INDICATORS							
S1 Membership in local organizations	0,77	0,53	1	0,1	0,85	0,61	0,5
S2 Access to training programs	0,89	1	0,93	1	0,68	0,68	1
S3 Access to protective clothing and equipment	0	0	0,93	1	0,18	1	1
S4 Accidents on plantation sites	1	1	1	0,9	0,19	0,66	0,89

S5 Access to education	0,66	0,66	1	0,66	0,66	0,33	0,33
S6 Access to health care	0,5	0,5	1	0,5	1	0,5	0,5
S7 Access to clear water	1	1	1	1	1	1	1
S8 Food security	0,77	0,5	1	1	0,5	0,41	0,5
S9 Housing	0,33	0,33	1	1	1	0,66	0,66
S10 Consultation in land use planning and S11 Respect for traditional land use aggregated	1	1	1	0,33	1	0,66	0,33
S12 In-migration of plantation workers	1	1	1	0,5	1	0,5	0
S13 Out-migration of local population	0	0	1	1	0,5	0	0,5
S14 Access to information considering plantation	0,66	0,33	0,66	1	0,66	1	1
S15 Mechanisms for conflict resolution	0,5	0,5	1	1	1	0,5	0,5
S16 Minimum employment age	0	0	0,5	1	0,5	1	1
S17 Preference based on race, social origin, gender, political opinion	1	1	0,5	1	1	0	1
<b>ECONOMIC INDICATORS</b>							
Ec1 Plantation income and coverage of the basic needs	0	0	1	0,5	0,5	0,5	1
Ec2 People working on the plantation	1	1	1	0,04	1	0,15	0,1
Ec3 Minimum day salary in USD for fieldworkers (1USD=4500Guarani, 1USD=10000Rp)	0,66	1	1	1	0	0	1
Ec4 Value added chains	0,07	0,17	0,07	0,6	0,12	0,23	0
Ec5 Target markets	0	0	1	1	0	0,5	1
Ec6 Expectation of problems with selling the products	0,73	0,85	1	1	0,9	0,75	1
Ec7 Prices for products	0	0	1	1	1	1	1
Ec8 Corruption and thefts	1	1	1	0,5	0,5	0	0
Ec9 Plantations linked with the future of the local children	0,89	0,93	0,93	0,9	0,93	0,91	0,78

Ec10 Investment cost in plantation/ha	1	1	0,5	0	0,5	0	0
Ec11 IRR	0,5	0,5	1	0,5	1	0,5	0,5
Ec12MAI	0,5	0,5	1	1	1	0,5	0,5
Ec13 Competition	1	1	1	1	1	1	1
Ec14 Access to loans	0	0	1	1	0,5	1	1
Ec15 Existence of perverse incentives, competing land uses	0	0	0	0	1	0	0
ENVIRONMENTAL INDICATORS							
En1 Land use before plantation	1	1	0,5	1	1	1	1
En2 Impact on water quantity	1	1	1	0	1	1	0,5
En3 Impact on water quality	0,75	0,75	0,75	0,75	1	0,75	0,75
En4 Use of exotic species and En5 Use of native species aggregated	0,5	0	0	0	1	1	1
En6 Use of clones	1	1	1	0	0	0	1
En7 Occurrence of local animals	0,5	0,5	0,5	0	0	1	0,5
En8 Influence of plantations on natural forest logging	0,5	0,5	1	1	1	0	0
En9 Pests	1	1	0,66	0,33	0	0,33	0
En10 Fires	0,66	1	1	0,33	1	0,33	0
En11 Restrictions on machinery	0,5	0,5	0,5	0,5	1	0,5	0,5
En12 Roads designed to minimize erosion	0	0	0,5	1	1	0	1
En13 Use and disposal of chemical substances	0	1	0,5	0,5	0,5	0,5	0,5
En14 Is the plantation certified? En15 Is certification in the future considered? Aggregated	0	0	0	1	1	1	1

**Table 5.1 (A) – Data after normalization**

## 5.1.2 Clusters of indicators used in the data analysis

### Social clusters

Participation
S1 Membership in local organizations
S2 Access to training programs
S10 Consultation in land use planning and S11 Respect for traditional land use
S14 Access to information considering plantation
Work safety and standards
S3 Access to protective clothing and equipment
S4 Accidents on plantation sites
S16 Minimum employment age
Access to services
S5 Access to education
S6 Access to health care
S7 Access to clear water
S8 Food security
S9 Housing
Human resources
S12 In-migration of plantation workers
S13 Out-migration of local population
S15 Mechanisms for conflict resolution
S17 Preference based on race, social origin, gender, political opinion

### Economic clusters

Benefit
Ec1 Plantation income and coverage of the basic needs
Ec2 People working on the plantation
Ec3 Minimum day salary in USD for fieldworkers
Ec4 Value added chains
Market access
Ec5 Target markets
Ec6 Expectation of problems with selling the products
Ec7 Prices for products
Ec13 Competition
Environment for investments
Ec8 Thefts

Ec9 Plantations linked with the future of the local children
Ec14 Access to loans
Ec15 Existence of perverse incentives, competing land uses
Profitability
Ec10 Investment cost in plantation/ha
Ec11 IRR
Ec12 MAI

### **Environmental clusters**

Plantation material
En4 Use of exotic species and En5 Use of native species
En6 Use of clones
Water
En2 Impact on water quantity
En3 Impact on water quality
Land use change
En1 Land use before plantation
En8 Influence of plantations on natural forest logging
Threats
En9 Pests
En10 Fires
Soil
En11 Restrictions on machinery
En12 Roads designed to minimize erosion
Habitat
En7 Occurrence of local animals
Chemicals
En13 Use and disposal of chemical substances
Certification
En14 Is the plantation certified? En15 Is certification in the future considered?

### 5.1.3 Final synthetic index

	Case Study I Smallholder Plantation with PMRN	Case Study II Smallholder Plantation with CDM	Case Study III Smallholder out-grower schemes	Case Study IV Enterprise POMERA	Case Study V Smallholder Community Plantation APHR	Case Study VI State enterprise Perum Perhutani	Case Study VII Enterprise MHP
Social	0,61	0,57	0,9	0,82	0,7	0,61	0,69
Economic	0,51	0,56	0,84	0,66	0,69	0,48	0,57
Environmental	0,49	0,61	0,56	0,49	0,69	0,62	0,61
Total sum	1,61	1,74	2,3	1,97	2,08	1,71	1,87
Total score (/3)	0,54	0,58	0,77	0,66	0,69	0,57	0,62

**Table 5.2 (A)** – Final synthetic index data

## 5.2 QUESTIONNAIRES

### STAKEHOLDER QUESTIONNAIRE FOR PARADIGM RESEARCH

#### 1. Land Ownership Mode

1.1 What is the status of the land according to the ITTO categories (2011)?

- public lands administrated by government
- public lands designed for use by communities and indigenous peoples
- private lands owned by communities and indigenous peoples
- private lands owned by individuals or firms

1.2 Is the current land ownership a matter of conflict? Yes/No

1.3 Is the local population allowed to use the plantation site in any way (examples: agroforestry, collecting fuel wood, NTFPs)? Yes/No How?

#### 2. Forest Management System

2.1 Who is mainly responsible for plantation management (community/national forest department/private owner)

2.2 Have you seen the forest management plan? Yes/No

2.3 Have you participated in decision making regarding the plantation? Yes/No

#### 3. Understandings / Goals of Plantations

3.1 What are the plantation products: fuelwood, industrial roundwood, NTFPs?

3.2 How do you perceive the plantation? Negatively/neutral/positively

3.3 Do you think that this plantation is important for the local people? Yes/No

3.4 Do you think that this plantation is important for your country? Yes/No

3.5 Do you think that this plantation has global importance? Yes/No

#### 4. Governance Practices / Outlook

4.1 Are plantation decisions taken externally? (top-down) Yes/No

4.2 Are plantation decisions taken locally? (bottom-up) Yes/No

4.3 Are plantation decisions negotiated? (horizontal) Yes/No

## 5. Knowledge and Expertise Status

- 5.1 Whose knowledge is the base for plantation management? (Actor)  
 5.2 Is the national forest service giving expertise? Yes/No  
 5.3 Is there any national research/university cooperation? Yes/No  
 5.4 Is there any international research/university cooperation? Yes/No

## 6. Capital Source and Production Potential

- 6.1 Is state contributing to financing of the plantation No/small role/extended role  
 6.2 Has community invested in the plantation? Yes/No  
 6.3 Are any bilateral, multilateral organizations or NGOs financing the plantation? Yes/No  
 6.4 Is the private sector investing in the plantation? Yes/No  
 6.5 Do you think the production potential for the plantation is: Small / medium / large

# QUESTIONNAIRE FOR SOCIO-ECONOMIC AND ENVIRONMENTAL EVALUATION

## SOCIAL PRINCIPLES, CRITERIA AND INDICATORS

Criteria	Indicators	Verifiers
Right to organize and collective bargaining		
	The workers have the right to join organizations defending their interests	Yes/No (The name of the organization)
	There exist acts of anti-union discrimination	Yes/No (Is it effective)
Elimination of child labor		
	Minimum employment age	Number /Min 15 years (ILO)
Elimination of forced labor		
	Only voluntary employment	Yes/No
Non-discrimination		
	No preference based on race, colour, social origin	Yes/No
	No preference based on political opinion	Yes/No
Gender rights		
	Equal remuneration for men and women for work of equal value	Yes/No
Training programmes		
	Training system for all workers	Yes/No (How often)
Safety and health		
	Access to protective clothing and equipment	Yes/No
	Do you know about any accidents on plantation sites	Yes/No (Number, specify)
	Control of chemical substances	Yes/No (Who controls)
Social services		
	Education	Yes/No (Specify)
	Health care	Yes/No (Specify)
	Clear water	Yes/No (Specify)
	Food security	Yes/No (Specify)
	Housing	Yes/No (Specify)
Respect of traditional land use rights and cultural values		
	Participation in land use planning	Yes/No (Mechanism)
	Intercropping (taungya)	Yes/No (Conditions)
	Mixed cropping (agroforestry)	Yes/No(Conditions)
	Recognition of traditional activities: hunting, fishing, trapping, gathering	Yes/No (Specify)
	Protecting sites and landscapes of archeological, cultural, traditional, spiritual, scientific, aesthetic or other socio-cultural significance	Yes/No



Migration		
	In-migration of plantation workers	Scale
	Out-migration of local population	Scale
Information access		
	Access to information considering plantation	Yes/No (Where)
Conflict resolution		
	Mechanisms for conflict resolution based on consultation and consensus	Yes/No (Are the effective)

## ECONOMIC PRINCIPLES, CRITERIA AND INDICATORS

Criteria	Indicators	Verifiers
Capital		
	Annual investment in plantation	Number
	Annual revenues	Number
	Internal Rate of Return	Number
Income distribution		
	Number of people employed	Number Male: Female: Migrants:
	Minimum wage	Yes/No (Value)
	Are there new employment sectors due to plantation?	Yes/No (What sectors)
	Remuneration corresponds to the level of wages in the country	Yes/No
	Remuneration covers the basic needs of workers and their families	Yes/No
	Social Security	Yes/No
Role of the market		
	Target market/s for products	Local/domestic/ Export (Specify)
	Competition	High/Low
	Recognizing emerging carbon markets	Yes/No
Demand		
	Are there problems with selling the products, lowering the price?	Yes/No (Why)
Prices		
	Prices obtained for plantation products	Price for m <sup>3</sup> (f.e. for fuelwood, industrial roundwood, NTFPs)
Environment for investments		
	Do you think that the forestry sector is less or more corrupt than other sectors of the industry?	Less/More (What sectors)
	Do you link local children's future with the plantation	Yes/No
	Access to loans	Easy/Uneasy (price, conditions)
	Existence of perverse incentives (with adverse trade, social, environmental impacts)	Yes/No (What)

## ENVIRONMENTAL PRINCIPLES, CRITERIA AND INDICATORS

Criteria	Indicators	Verifiers
Background		
	What was the plantation land before?	Land use type
	Has the EIA been carried out?	Yes/No (By whom)
Water		
	Impact on water quantity	Specify
	Impact on water quality	Specify
Soil		
	Restrictions on machinery	Yes/No (What)
	Roads designed to minimize erosion	Yes/No
Biodiversity		

	Management practices to maintain biodiversity on stand and landscape levels	Yes/No
	Monitoring ecosystem diversity	Yes/No (By whom)
	Monitoring species diversity	Yes/No (By whom)
	Monitoring genetic diversity	Yes/No (By whom)
	Introduced species	Yes/No
	GMOs	Yes/No (What species)
	Endangered species population	Increase/Stable/Decrease Specify
Fires		
	Fire management	Yes/No (Measures)
Pests		
	Integrated pest management	Yes/No
	Use of herbicides	Yes/No, frequency
	Use of pesticides	Yes/No, frequency
	Use of fungicides	Yes/No, frequency
	Disposal of chemical materials at appropriate off-site locations	Yes/No
Natural Forest		
	Do you think that less natural forest is logged because forest plantations are developed?	Yes/No
	Wildlife corridors	Yes/No
	Buffer zones	Yes/No (Size)
Certification		
	Is the plantation certified?	Yes/No
	Is certification in the future considered?	Yes/No Why? Why not?

## **EXPERT INTERVIEW**

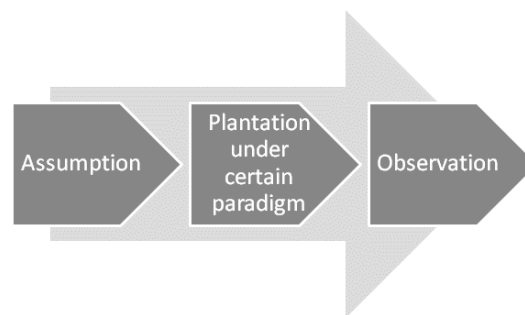
1. What is your personal experience related to timber plantations? (example: work, research, policy making regarding timber plantations)
2. What is your view on to-date development of timber plantations? What are the main obstacles and success stories (if any)?
3. Do you see any trends (changes and/or continuities) in the development of the timber plantation sector? (new actors, change in species and plantation goals, sources of finance)
4. Do you know any timber plantation project which has been particularly successful, with positive socio-economic and environmental impacts? (can be a company, smallholder, development project, out-grower scheme) Why?
5. What are in your opinion the main opportunities for the development of the timber plantation sector? How important in your view are timber plantations for the future of the country's forestry? (raw material, employment, export earnings, decreasing pressure from natural forests, regeneration of degraded land)
6. What are in your opinion the main threats for the development of the timber plantation sector? (conversion of natural forest, biodiversity loss, monocultures, corruption, fluctuating employment, resettlements)
7. How do you judge the national laws regarding the timber plantations? (example: reforestation fund). Are they addressing the needs well? Are they implemented well? If yes, how so. If not, why?
8. What in your opinion could be done to improve the situation of forest plantations? Should the sector be expanded? Should it be more controlled? Or decentralized at the province level? Community and smallholder plantations? More state actors? Private companies? Foreign investments? Certification?
9. What are the major changes that you see in timber plantation development in the country in the last 5/10/20 years?

+ specific questions prepared for each expert depending on the person's personal background and function

## Annex to Chapter 6

### 6.1 DETAILED COMPARATIVE ANALYSIS: GLOBAL PARADIGMS AND THE LOCAL PERFORMANCE OF SELECTED PLANTATIONS. ASSUMPTIONS VS. OBSERVATIONS

This Annex complements Chapter 6 with a detailed analysis of the paradigm fit and presents the reference data from field surveys and from the correlation analysis. It starts with the visualization of key comparative figures (6.1.1) that are later discussed and referred in the analysis. The original assumptions are compared with the field observations from plantation case studies in Paraguay and Indonesia (logic of reasoning, Figure 6.1[A]) and are presented subsequently for every paradigm (6.1.2).

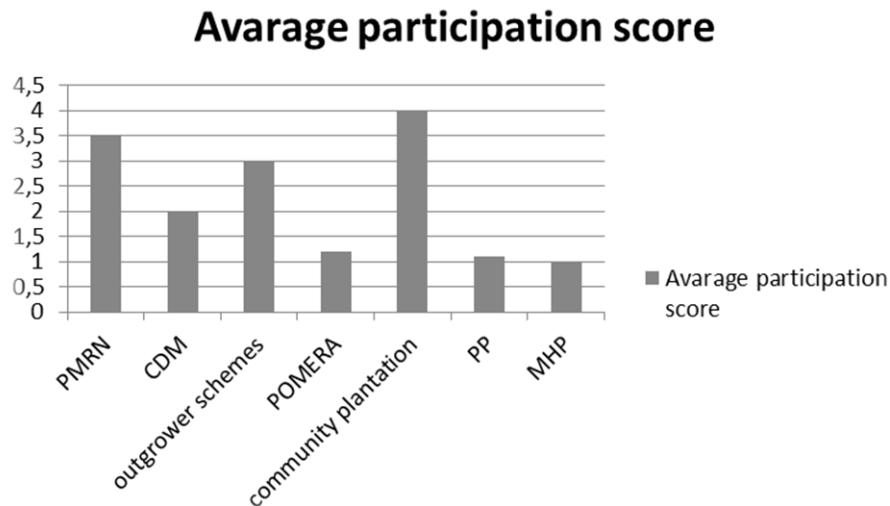


**Figure 6.1 (A)** – Logic of reasoning

Every assumption is compared with actual observations from the case studies and the equivalent counterparts are always presented under the same numbers (i-xi). At the end of the Annex in the Section 6.1.3 a synthetic table for paradigm fit is presented [6.6 (A)]. At the remainder of the document, the results of the correlation analysis between the paradigms and studied indicators, that are often referred to in Chapter 6, are listed (6.1.4).

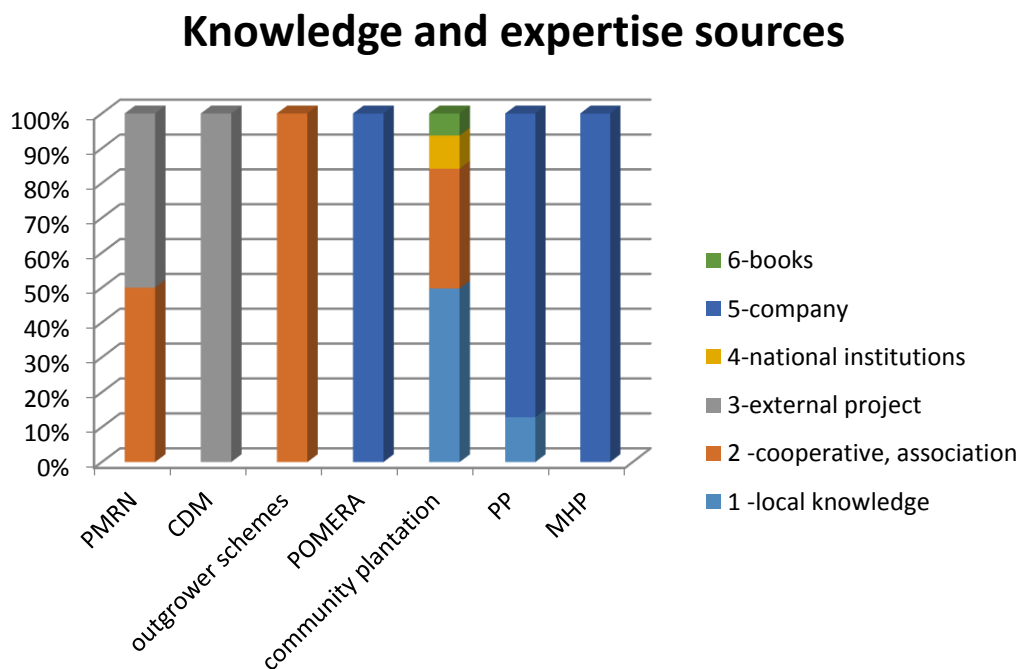
### 6.1.1 Comparative figures

#### *Participation in plantation decision-making*



**Figure 6.2 (A)** - Local involvement score on analyzed plantation<sup>42</sup>

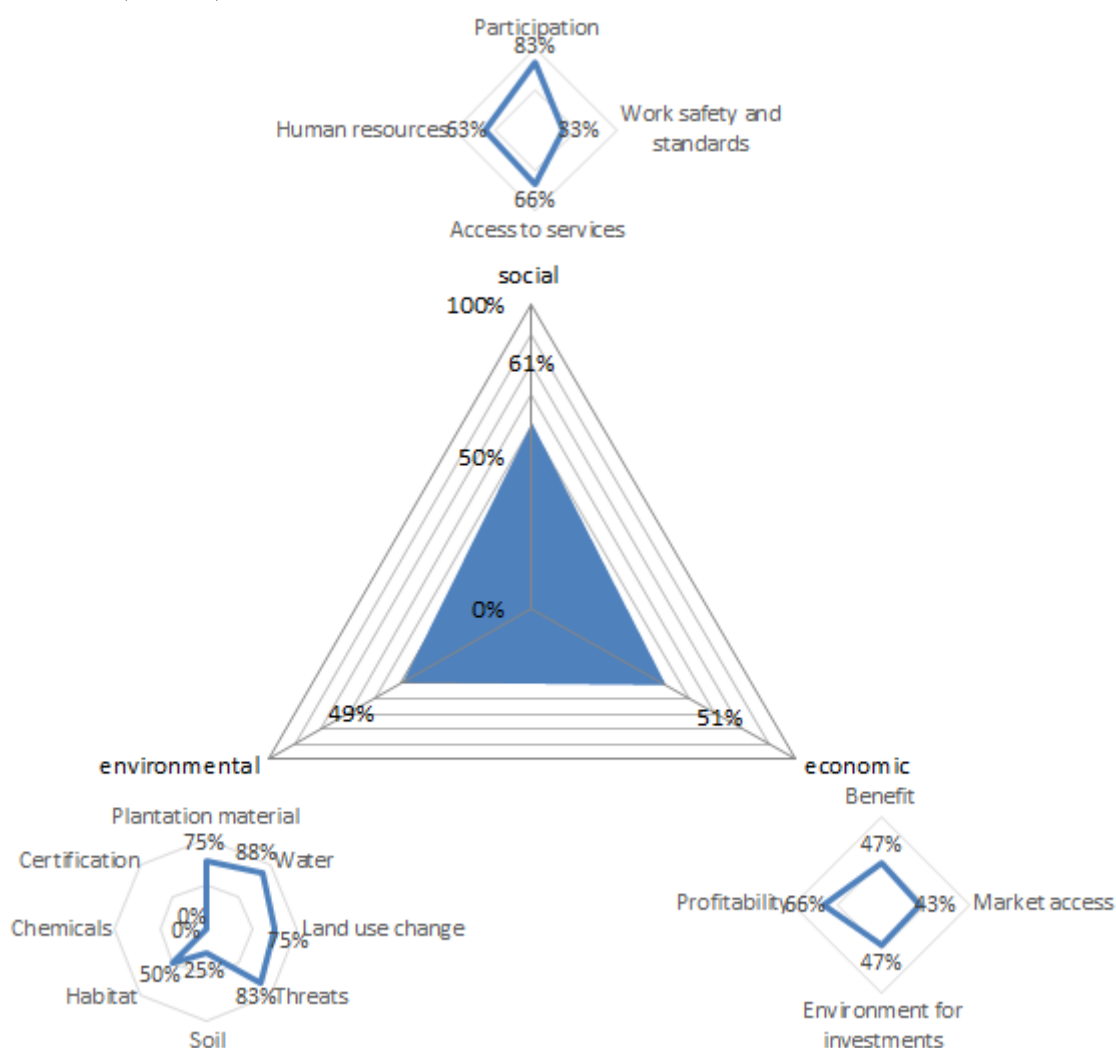
#### *Plantation' related knowledge*



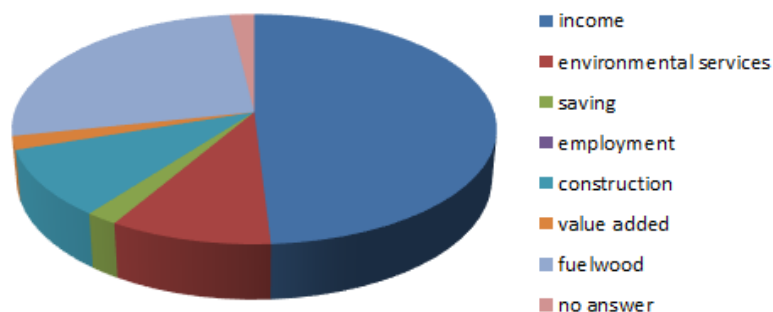
**Figure 6.3 (A)** - Knowledge and expertise sources on the analyzed plantation

<sup>42</sup> Average score created from two indicators – respondents' involvement in decision making regarding the plantation and respondents' membership in local organizations (0 = no involvement; 1 = minimal; 2 = small; 3 = visible, 4 = large involvement).

*Plantation performance and perceived benefits according to the stakeholder surveys for all case studies (I – VII)*



**Figure 6.4 (A) - Case Study I Smallholder Plantation with PMRN**



**Figure 6.5 (A) - Perception of local plantation benefits by stakeholders in case study I Smallholder plantation with development aid, San Pedro Department, Paraguay**

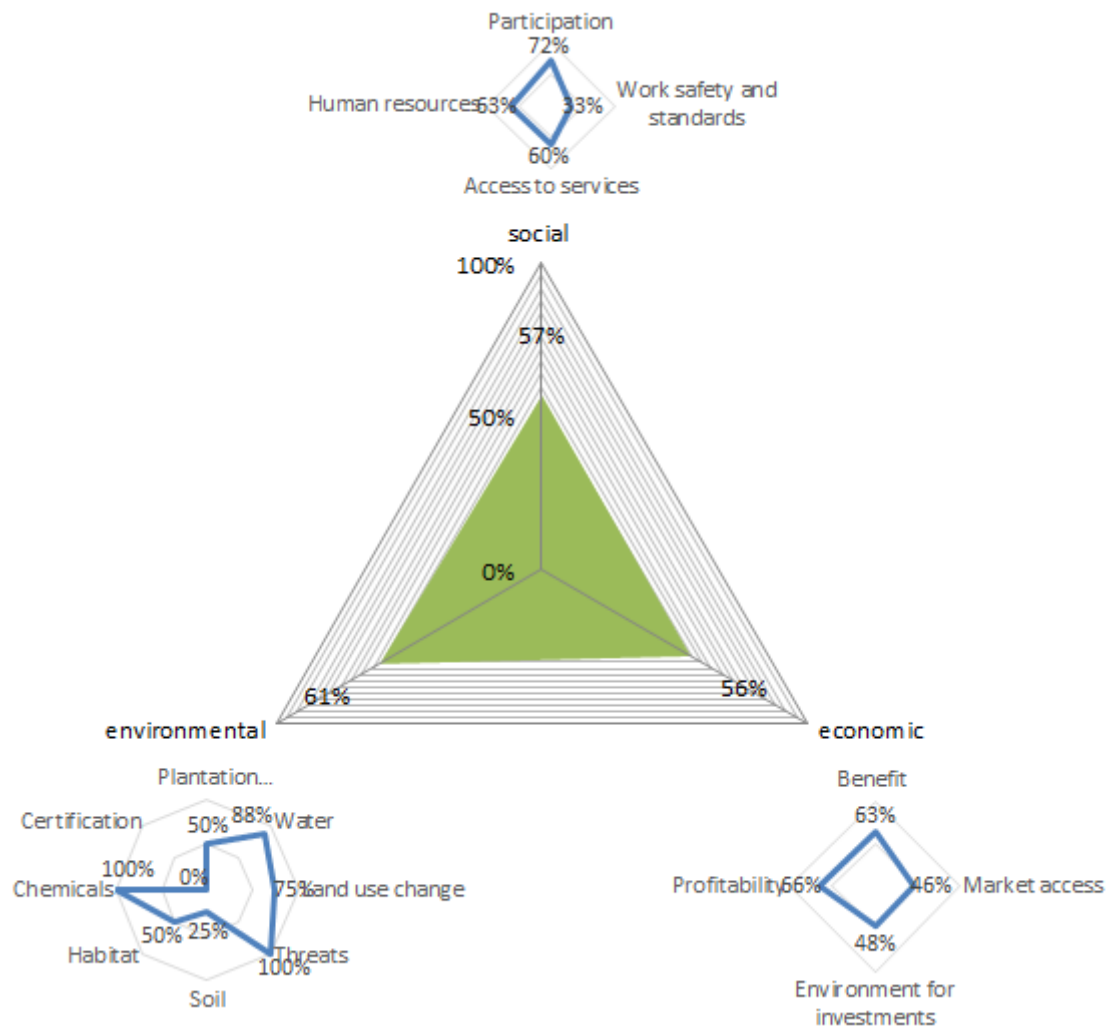
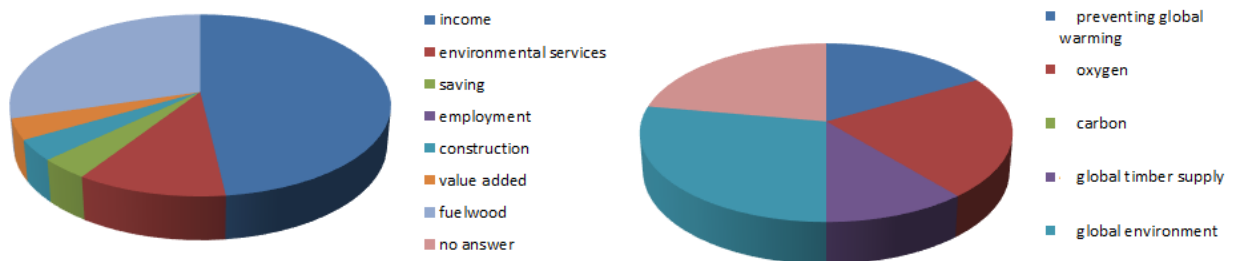


Figure 6.6 (A) – Case Study II Smallholder Plantation with CDM



Figures 6.7 (A) and 6.8 (A) - Perception of local and global plantation benefits by stakeholders in case study II Smallholder plantation with Clean Development Mechanism, Paraguari Department, Paraguay

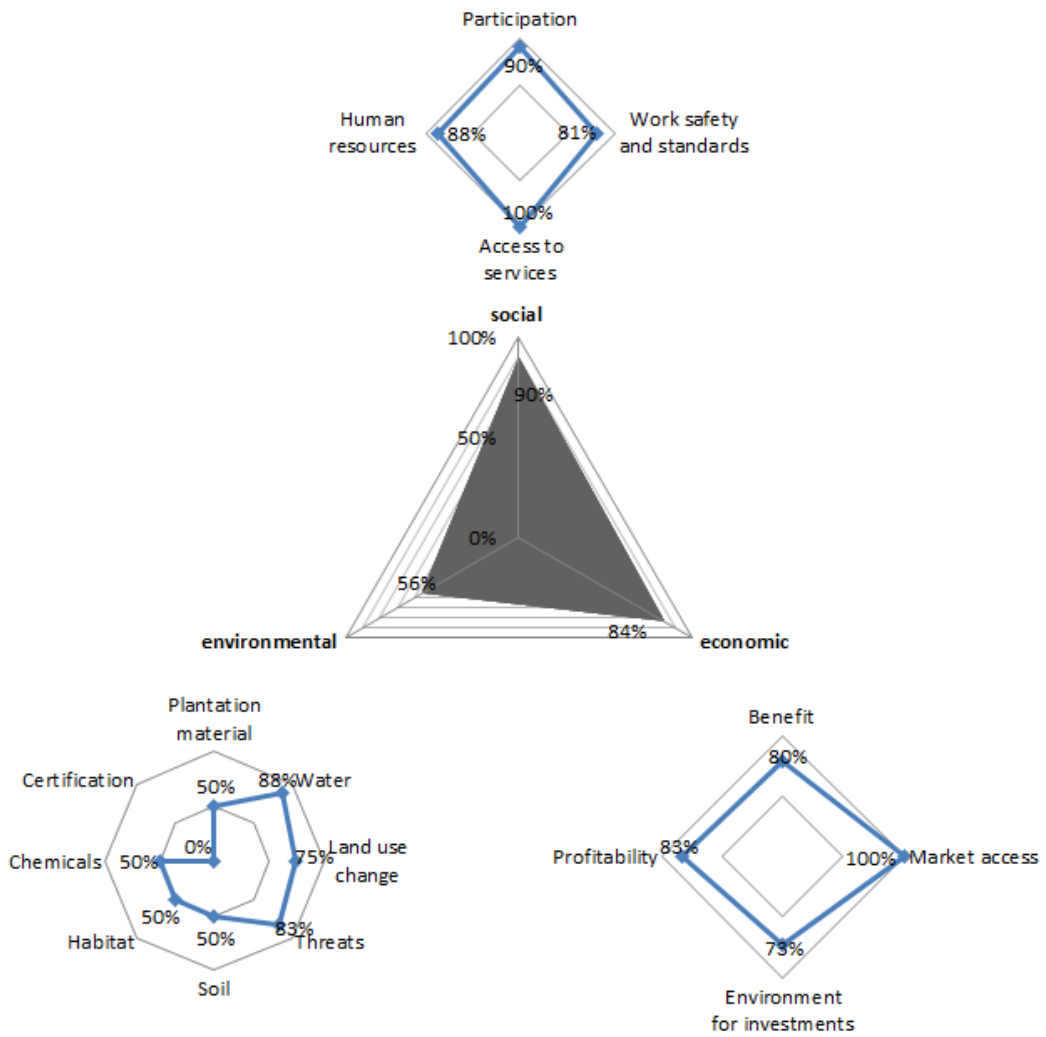


Figure 6.9 (A) – Case study III Out-grower schemes in Itapua, Paraguay

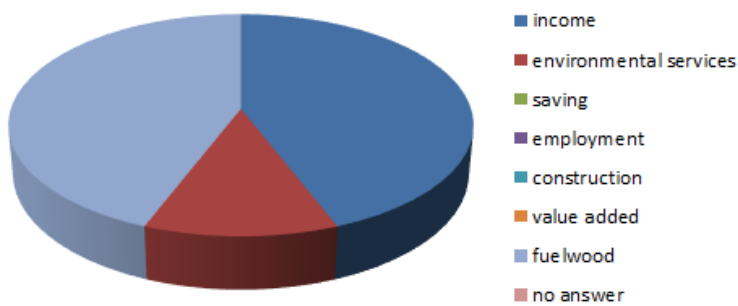
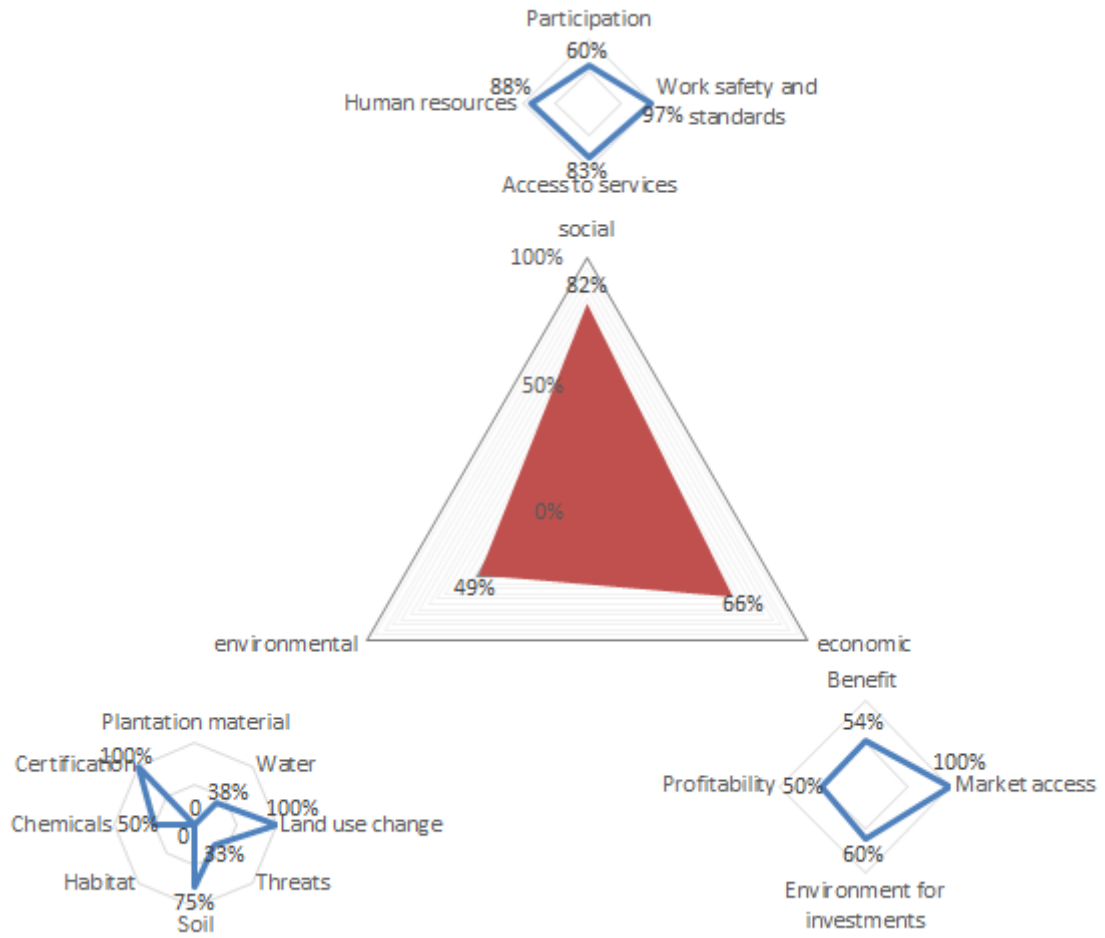
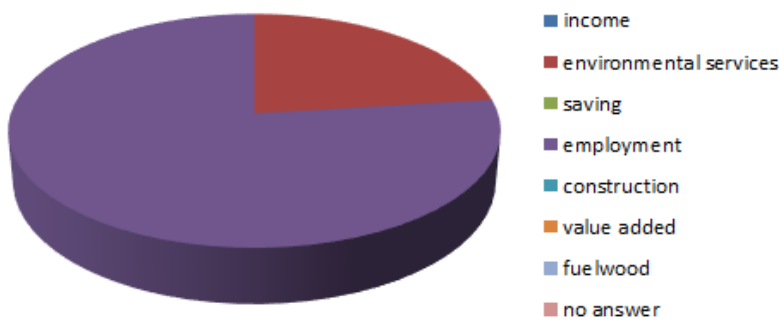


Figure 6.10 (A) - Perception of local plantation benefits by stakeholders in case study III Out-grower schemes in Itapua, Paraguay

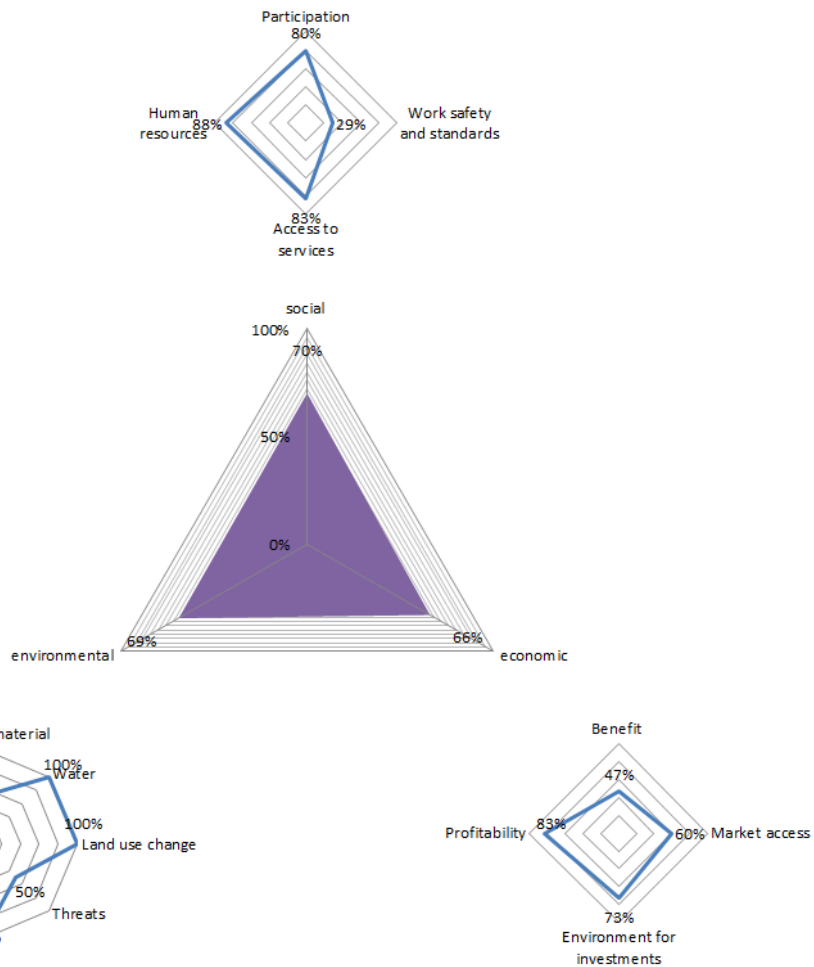


**Figure 6.11 (A) – Case Study IV Enterprise POMERA**

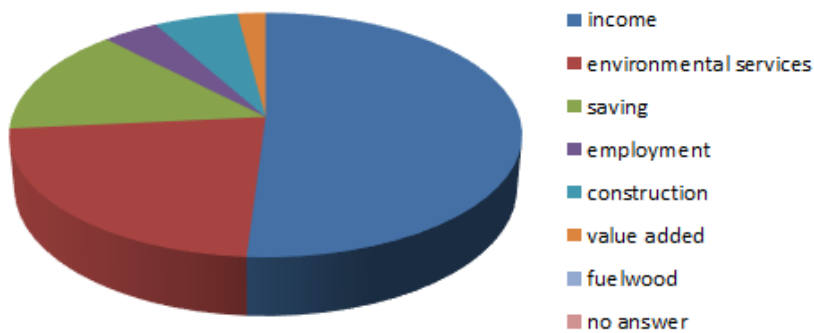


**Figure 6.12 (A) - Perception of local plantation benefits by stakeholders in case study IV Enterprise POMERA, Alto Parana Department, Paraguay**

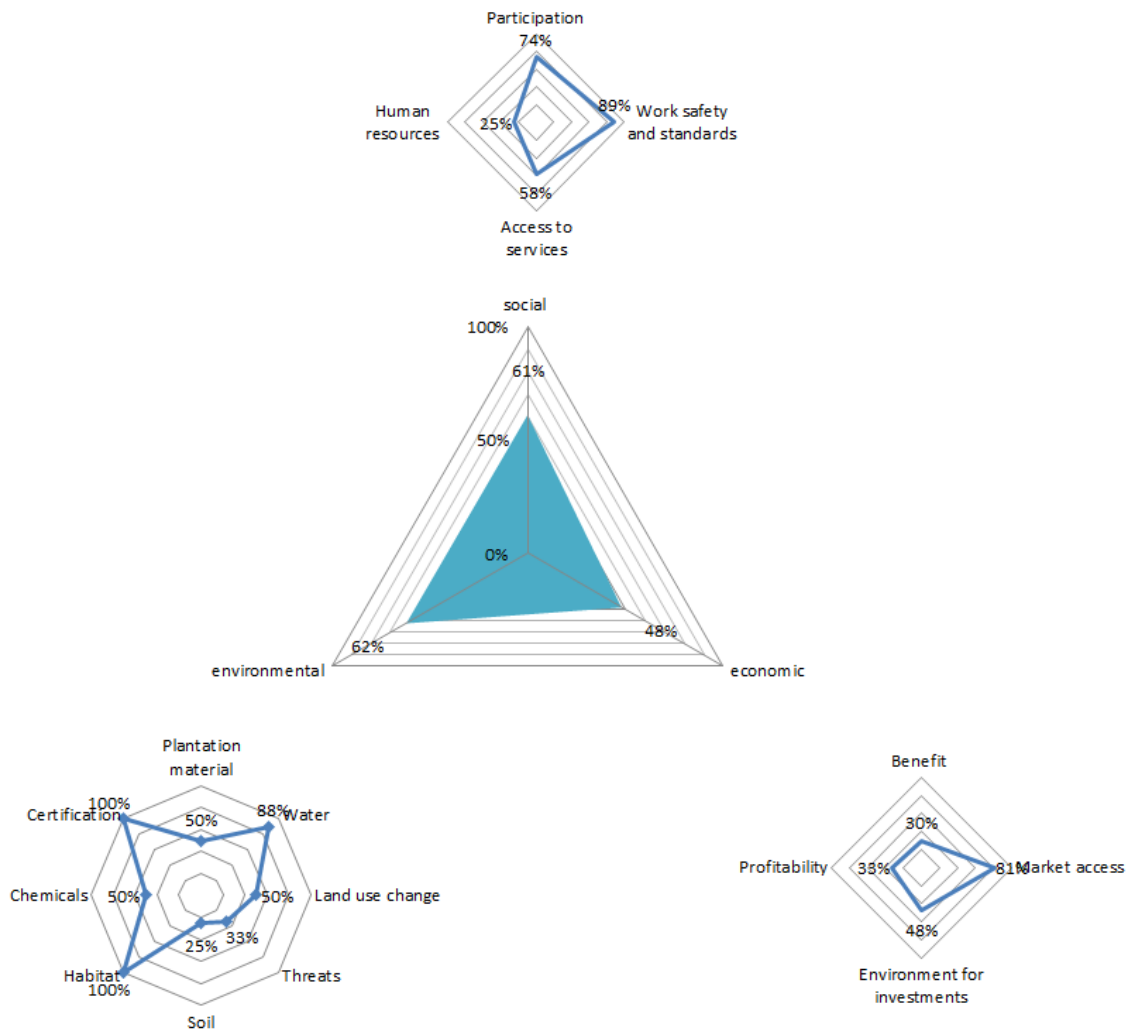




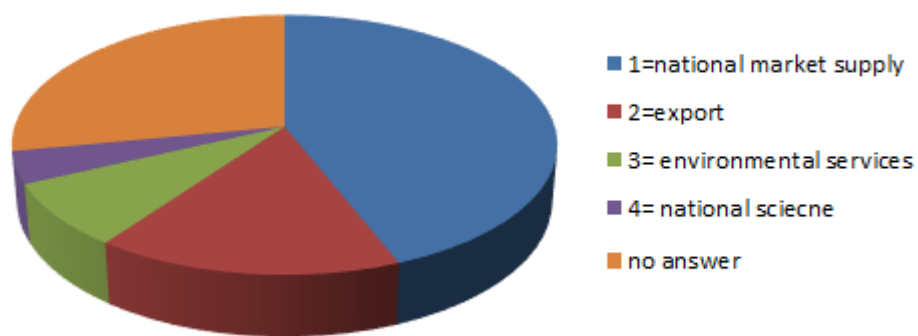
**Figure 6.13 (A)** - Case study V – Community plantation through Community Forest Owners Association, Regency Wonosobo, Indonesia.



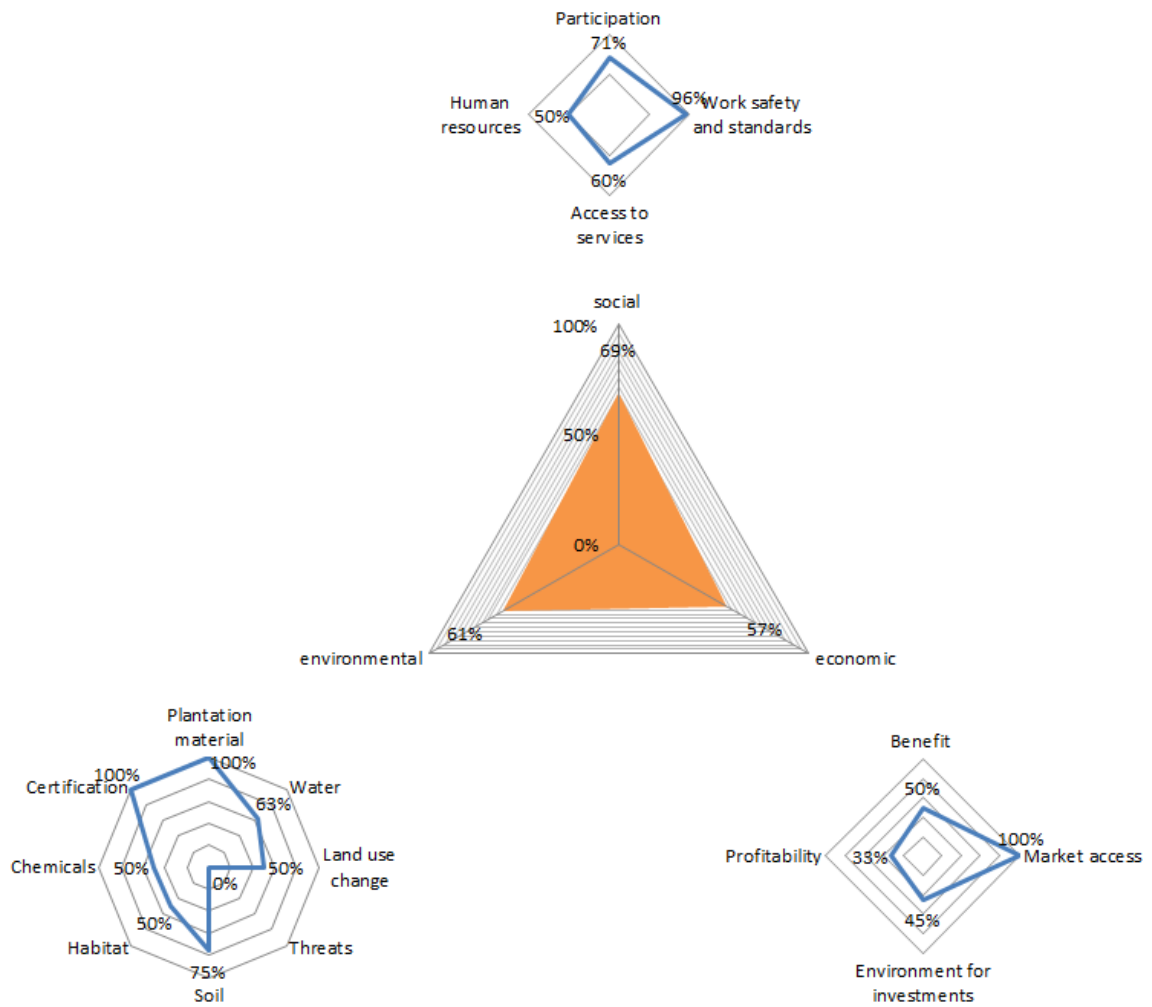
**Figure 6.14 (A)** - Perception of local plantation benefits by stakeholders in case study V Community plantation through Community Forest Owners Association, Regency Wonosobo, Indonesia



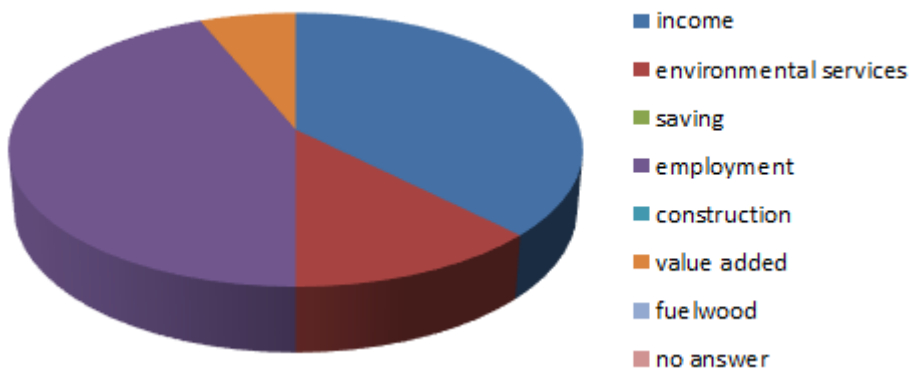
**Figure 6.15 (A)** - Case study VI State enterprise Perum Perhutani, Regency Randublatung, Indonesia



**Figure 6.16 (A)** - Perception of national plantation benefits by stakeholders in case study VI State enterprise Perum Perhutani, Regency Randublatung, Indonesia



**Figure 6.17 (A) - Case study VII – Enterprise Musi Hutan Persada, Regency Muara Enim, Indonesia.**



**Figure 6.18 (A) - Perception of local plantation benefits by stakeholders in case study VII Enterprise Musi Hutan Persada, Regency Muara Enim, Indonesia**

## 6.1.2 Comparative analysis according to the paradigms

### INDUSTRIAL NATIONAL PARADIGM

#### Assumptions

The inductive research presented in Chapter 4, identifying paradigms in forest plantations pointed to some specific assumptions that should be characteristic for the industrial national paradigm in plantations worldwide. Those specific features have been discussed in detail in the categorization of plantation paradigms and are shortly summarized in the table below.

PARADIGM (approximate period)	Land Ownership/ Forest Management	Understandings / Goals of Plantations	Governance	Knowledge and Expertise	Capital Source / Potential Growth Rate
2.b INDUSTRIAL POST-COLONIAL (NATIONAL) (1950-present)	Central control, National Forest Departments	Economic goals, "progress" (technocratic forestry)	Top-down (newly independent State - plantations)	National scientific forestry educated in/ by the West	State incentives  Moderate growth rate (both softwood and hardwood)

**Table 6.1 (A)** - Brief characteristics of the industrial national paradigm in forest plantations

In many countries with the increased private capital flowing to the forestry sector, governments withdrew from such large scale forestry project. As an example, there are no more plantations in Paraguay, where the state would be the administrating actor. However in Indonesia, the state forestry company still remains one of the biggest plantation players, especially in teak plantations. Therefore the case study selected for the analysis is:

- *Case study VI State enterprise Perum Perhutani, Regency Randublatung, Indonesia*

Assumptions for the industrial national paradigm in forest plantations are:

- The industrial national paradigm in forest plantations should be nationally empowered since the end of colonialism
- It is expected to correspond to big plantation areas, with formal state land titles, possibly high land conflict and a uniform land use
- It should be characterized by low local involvement in decision-making and low membership in local organizations
- It should promote technocratic forestry with a strong discourse towards "progress" and "national interest" where national benefits are being prioritized over the local goals
- It is expected to offer vertical top-down governance with hierarchical power structures
- Knowledge and expertise should have centralized sources, often inspired by the plantation management in the colonial period
- Capital for the plantations should come directly from the state
- Plantation growth rates are expected to be moderate as state plantations operate both with short and long rotation species, softwood and hardwood
- The industrial national paradigm should have a weak performance of the social indicators
- Economic performance of plantations under the industrial national paradigm should be good, long-term, export oriented
- Environmental performance of plantations under the industrial national paradigm should be moderate and not prioritized, in accordance with the national environmental standards

## Observations

- i. Following Indonesia's independence in 1945 and withdrawal of the Dutch in 1949, the Forestry Office of the Republic of Indonesia has been created. It aimed to assure that the forestry sector will contribute to the national economy. Due to the political instability, it took some years to introduce the corresponding Forestry Law of 1967 and to create State Forest Companies (Perhutani) which in 1972 became Perum Perhutani. One of the crucial competences of the state companies was management of large scale teak plantations on Java.
- ii. Perum Perhutani manages an extensive forest area of 2 442 101 ha, including 1 750 860 ha of production forest, constituted mainly by teak plantations. It is divided into three main units, further divided into forest management units. Most of the company's land is land that has been taken by the colonial powers and in the overpopulated Java creates land conflicts with the local communities, where landless farmers are an increasing phenomenon. In recent years the company started to introduce programs for benefit sharing with the local communities. Although widely implemented, it still gives quite limited opportunities for the local populations.
- iii. State managed plantations in Java, similarly to the plantations managed by private companies discussed in the neoliberal paradigm paragraph, are characterized by low local involvement in decision-making and low membership in local organizations (see: Figure 6.2 (A)). Correlation analysis shows that the industrial national paradigm is the strongest negatively correlated with participation (Pearson correlation at  $-.612^{**}$ ).
- iv. Stakeholders on the state plantation very often refer to the national role that the plantation has to play. As the graph shows national market supply and export earnings are listed in the first place. Also improving the country's environmental situation and adding to the national forestry knowledge is seen as an important role of the state plantation (see: Figure 6.16 (A)). It is the only paradigm with a positive and significant correlation with national export (Pearson correlation at  $.204$ ).
- v. The company is organized very hierarchically and the decisions from the headquarters in Jakarta are to be implemented in units, later districts and sub-districts. Such power relations are also replicated in the management units and field units and manifested through differentiated military-style hierarchical uniforms. With the new Community Based Forest Management (PHBM) scheme, the company started to take into account the local communities.

However this is still a rather instrumental shift and communities are involved in decision making regarding issues of lower importance.

vi. Knowledge and expertise applied on the state plantation are predominantly coming from the Perum Perhutani own guidelines. However, some stakeholders refer to the local knowledge regarding teak that they apply in their jobs. This is understandable because teak plantations have been established in Java many decades ago by the Dutch authorities and local people used to work on them from generations. However, there is no official incorporation of local knowledge in the company's guidelines (see: Figure 6.3 (A)).

vii. Capital for the plantations is coming from the management company Perum Perhutani, which operates under the Ministry of State Enterprises (BUMN) with technical guidance from the Ministry of Forestry. Its revenue in 2010 was 184 million dollars with a net profit of 14 million dollars (Hidayat 2011). There is a strong positive correlation with the state support and cooperation with national universities (Pearson correlation at .234\*\* and .312\*\*).

viii. Plantation growth rates are moderate with MAI 4-8 m<sup>3</sup>/ha/year (for long 70 years rotations) of *Tectona grandis*. The company is introducing a Perhutani superior teak, which is expected to double the growth rates.

ix. The industrial national paradigm has a weak performance in social indicators. Especially access to services is limited for the poorer stakeholders and human resources issues show very significant shortcomings (see: Figure 6.15 (A)).

x. Economic performance of plantations under the industrial national paradigm is worse than expected. The weakest cluster is benefit sharing. The company has good market access, however now it competes on the international markets with other teak producers as Thailand, India or China. With a problematic environment for investments (conflicts, thefts, fires) and low profitability, extended in time, the economic performance of the plantation is constantly challenged (see: Figure 6.15 (A)).

xi. Environmental performance is moderate. Some environmental issues are quite promising – f.e. with such long rotations plantation performs important habitat functions, voluntary certification brings better environmental standards. However the plantations are also highly exposed to environmental threats, roads and plantation areas are much affected by heavy equipment and the plantation material is uniform (see: Figure 6.15 (A)).

## SOCIAL PARADIGM

### Assumptions

Chapter 4 pointed to some specific assumptions that should be characteristic for the social paradigm in plantations globally. They are shortly summarized in the table below:

PARADIGM (approximate period)	Land Ownership/ Forest Management	Understandings / Goals of Plantations	Governance	Knowledge and Expertise	Capital Source / Potential Growth Rate
SOCIAL  (ca. 1970-present)	State and village common land, regulated community use (non-exclusive)  Participatory management.	Equitable growth (responsible forestry)	Horizontal	Multiple; local knowledge, adapted technology transfer  Participatory local governance	Community investment, projects financed by bilateral, multilateral organizations, NGOs, private foundations  Moderate growth rate (lower productivity in agroforestry systems)

**Table 6.2 (A)** - Brief characteristics of the social paradigm in forest plantations

Based on those characteristics, main assumptions of the social paradigm have been listed below and will be subsequently discussed for their fit with two case studies that are supposed to reflect the social paradigm in Paraguay and in Indonesia:

- *Case study I Smallholder plantation with development aid from PMRN project, San Pedro Department, Paraguay*
- *Case study V Community plantation through Community Forest Owners Association, Regency Wonosobo, Indonesia*

Assumptions for the social paradigm in forest plantations are:

- i. The social paradigm in forest plantations should be nationally empowered since the 1970s
- ii. It is expected to correspond to relatively small plantation areas, with formal/informal land titles, limited land conflict and a diversified land use on plantation sites (with different forms of agroforestry, silvopasture etc.)
- iii. It should be characterized by high local involvement in decision-making and membership in local organizations
- iv. It should promote responsible forestry with a wider range of local benefits compared to the other paradigms
- v. It is expected to offer horizontal governance without hierarchical power structures
- vi. Knowledge and expertise should have multiple sources and external knowledge should be adapted to the local needs
- vii. Capital for the plantations should come directly from the communities or development projects
- viii. Plantation growth rates are expected to be moderate due to small scale and adoption of agroforestry systems
- ix. The social paradigm should outcompete the other paradigms in performance of the social indicators
- x. Economic performance of plantations under the social paradigm should offer more wealth redistribution but should be less successful in absolute terms
- xi. Environmental performance of plantations under the social paradigm should be relatively good due to the diversified land use, use of native species, manual labour etc.

## Observations

- i. In Paraguay plantations organized according to the social paradigm have been empowered under development projects from the 1980s, with the first project initiated by the Forestry Service, the Paraguayan Agricultural Extension Service with assistance of the US Peace Corps and the Swiss Technical Mission. It promoted reforestation by smallholders, establishment of local tree nurseries and adapting forestry innovations. The studied case of PMRN plantations is similarly rooted in development aid and started in 2003 due to an external project initiated by the German Development Agency (GTZ/ GIZ) and the German Reconstruction Loan (Kreditanstalt für Wiederaufbau – KfW), and supported by the Paraguayan Ministry of Agriculture and Livestock.

In Indonesia plantations with social paradigm characteristics started slowly in the 1970s with pilot programs for community based plantations and corporate cooperation with communities. The Indonesian case study of the community plantations in Wonosobo started exactly in the 1970s and is an established land use pattern until today.

- ii. Plantations under the social paradigm in both countries correspond to small individual plantations (mean individual plantation size in the visited plantations in the PMRN project (n=28) was 0,91 hectares, and mean individual plantation size in the community plantation in Wonosobo (n=34) was 0,69 hectares), have relatively clear land titles and sporadic conflicts (one land conflict reported in the stakeholder interviews in the Paraguayan and one in the Indonesian case), and offer additional land use options (64% of the visited plantations in the PMRN project used agroforestry systems, 4% silvopasture while 100% of the Wonosobo plantations applied agroforestry).
- iii. Social paradigm plantations completely outrank the others in terms of local involvement in decision making and membership in local organizations (see: Figure 6.2 (A)). The social paradigm is strongly positively correlated with local participation (Pearson correlation at .743\*\*).
- iv. Plantation projects conducted under the social paradigm in both countries provide a rich range of local plantation products and services (income, environmental services, saving, employment, construction, value added and fuelwood), no other analyzed plantation case-



study has such a diversified range of plantation products. Unlike the projects developed under other paradigms, social paradigm plantations show a strong positive correlation with bringing local means of savings (see: Figure 6.5 (A) and 6.14 (A)). Social paradigm, unlike other paradigms, positively correlates with local means of savings (Pearson correlation at ,217\*\*).

- v. Social paradigm plantations in both countries have bottom-up decision making systems with potential advice coming from project or local institutions, and the final decisions made by the owner. This bottom-up decision making has been confirmed by all interviewed stakeholders in both case studies.
- vi. Knowledge and expertise are not centralized on social paradigm plantations, in both case studies there are more sources of knowledge compared to the other case studies. However the smallholders in Paraguay are much more dependent on projects and smallholders in Indonesia were more successful in combining various sources of expertise (traditional knowledge, books, extension programs, trainings from the local association). This may be explained by lack of traditional knowledge on tree planting in Paraguay, limited engagement of national institutions in know-how and difficulties in accessing trainings, information materials and technical education. Social paradigm has strong positive correlation with diversified sources of knowledge: local knowledge, knowledge from cooperatives/ associations, knowledge from projects, knowledge from national institutions and knowledge from books (Pearson correlation at .495\*\*, .545\*\*, .216\*\*, .225\*\* and .182\*).
- vii. Both case studies have been financed differently, but in a typical way expected for social paradigm plantations. In Paraguay the plantation project started with external financial support but some farmers will continue tree planting on their own after the project expired; in Indonesia the initiative and funds came from the community itself.
- viii. MAI in Paraguay was medium, definitely lower for the social paradigm compared to the same species planted under the neoliberal/ neoliberal-modified paradigms (about 20 m<sup>3</sup>/ha/year for 7-12 years *Eucalyptus* rotations). However in Indonesia the MAI was large with scores over 25 m<sup>3</sup>/ha/year. The Indonesian smallholder plantations have been better

cared for, with weeding, fertilization, thinning and pruning. Such well-established plantations by smallholders can even compete with industrial plantations on their production potential.

- ix. Social paradigm plantations show a very strong performance in social clusters – participation, human resources and access to services but limited in work safety and work standards. Work safety is low due to the very limited access to safety equipment and tools, accidents and incidents on plantations are common, so is child labor (although in the Indonesian case study there exists a stronger respect to school time). Due to this fact its social performance has been surprisingly outcompeted by another case study from Paraguay, the outgrower schemes that were chosen as an example of the neoliberal modified paradigm (see: Figures 6.4 (A) and 6.13 (A)).
  
- x. Overall economic performance of plantations under the social paradigm is weaker than the social performance. In both cases benefits are rather low but equally redistributed and market access is limited. Yet net income stays on farms due to low initial investment costs and farm labor. The environment for investments was better on the plantation case from Indonesia (loan program, no competing land uses) and more limited in Paraguay (no access to microfinance and incentives for other land uses, especially cash crops) (see: Figures 6.4 (A) and 6.13 (A)).
  
- xi. Environmental performance of plantations under the social paradigm was weaker than expected (positive for water resources and land use change, mainly from marginal agricultural land to forest plantations) but many of the particular weaknesses are case-specific. In Paraguay the main weaknesses were not controlled and disposed chemicals, soil erosion problems, and lacking environmental reference points – neither respect to national laws nor certification standards. In Indonesia the environmental problems were poor plantation material, environmental threats, habitat loss due to intensive agroforestry management, and only partial control over chemicals (see: Figures 6.4 (A) and 6.13 (A)).

## NEOLIBERAL PARADIGM

### Assumptions

As discussed in Chapter 4, some specific characteristics accompany the neoliberal paradigm in plantations worldwide. Those distinctive features are shortly summarized in the table below.

PARADIGM (approximate period)	Land Ownership/ Forest Management	Understandings / Goals of Plantations	Governance	Knowledge and Expertise	Capital Source / Potential Growth Rate
5.a NEOLIBERAL  (ca. 1980-present)	Exclusive, private land accumulation Private	Profit	Top-down	International Scientific Forestry	Private sector investments, multinational capital ventures,  High growth rate

**Table 6.3 (A)** - Brief characteristics of the neoliberal paradigm in forest plantations

Selected case studies reflecting the neoliberal paradigm in Paraguay and in Indonesia:

- *Case study IV Enterprise POMERA, Alto Parana Department, Paraguay*
- *Case study VII Enterprise Musi Hutan Persada, Regency Muara Enim, Indonesia*

Assumptions for the neoliberal paradigm in forest plantations are:

- i. The neoliberal paradigm in forest plantations should be nationally empowered since the 1980s
- ii. It is expected to correspond to relatively big plantation areas, with exclusive, private land titles and aggregated land accumulation, increased land conflict and a uniform land use on plantation sites
- iii. It should be characterized by low local involvement in decision-making and membership in local organizations
- iv. It should promote technocratic forestry with a limited range of local benefits
- v. It is expected to offer vertical, top-down governance with hierarchical power structures
- vi. Knowledge and expertise should come from international scientific forestry developments and trends
- vii. Capital for the plantations should come directly from the private sector investors, often multinational capital ventures
- viii. Plantation growth rates are expected to be high due to scale and intensive management with modern technology
- ix. The neoliberal paradigm should perform weakly in the social indicators
- x. Economic performance of plantations under the neoliberal paradigm should be very high in absolute terms, but not lead to a balanced wealth distribution
- xi. Environmental performance of plantations under the neoliberal paradigm should be limited, comply with the lowest national environmental standards

## Observations

- i. In Paraguay the neoliberal paradigm to plantations came relatively late. Due to many factors, as the end of the dictatorship in 1989, a tremendous decrease in natural forest cover, and because of the law 536 (1995) called the law of incentives from 1995, private financial flows to plantations can be observed. In the 1990s Shell group started to invest in *Eucalyptus* plantations that have been taken over by the company Pomera in 2001-2004. In 1997 Copetrol started to invest in reforestation projects or plantations managed by the Vista Alegre Trust Fund in San Pedro. However such plantations are a marginal land use and due to many constrains Paraguay has not been that affected by the neoliberal turn in plantations as its neighbours are.

On the contrary, Indonesia followed a rather typical pattern of the neoliberal turn in plantations from the 1970s. From this time a powerful pulp and paper industry supported by large private timber plantations has been created. In the 1970s the structures of Asia Pulp and Paper and Asia Pacific Resources International Holdings emerged, that vertically integrated pulp and paper production processes from plantation establishment and maintenance, transport, processing and marketing of the final product. The government's HTI plan initiated in 1983 additionally boosted the private timber plantation sector. The trend continued and the government further leased large land areas for plantations.

Both analyzed plantations, POMERA and MHP, have been established in 1996.

- ii. Plantations under the neoliberal paradigm lead to land accumulation. In the case of POMERA, the company planted 7000 hectares and has capacity to expand as it owns 21 000 hectares of land. Land accumulation is much more visible in the case of Musi Hutan Persada that effectively planted 193 500 hectares. Both companies have exclusive land use policy; POMERA owns the plantation land, while MHP operations are based on a long lease concession. In POMERA 20% of stakeholders acknowledge the existence of land-related conflicts, in the case of MHP it is 100% of the stakeholders. Both plantations use uniform land use patterns, with monocultures.
- iii. The neoliberal paradigm plantations are among the weakest in terms of local involvement in decision making and membership in local organizations (see: Figure 6.2 (A)). Similarly

to the industrial national paradigm, the neoliberal paradigm in plantations is negatively correlated with local participation (Pearson correlation at  $-.389^{**}$ ).

- iv. Plantation projects conducted under the neoliberal paradigm see the planting activity as a narrow technical issue. Although both companies in their documents and the managerial staff refer to a wide range of benefits for the local populations, stakeholder surveys identified a relatively low number of benefits coming from both plantations. The most important in both cases was the employment possibility provided by the company and the resulted income. Neoliberal paradigm is positively correlated only with one local benefit: employment generation (Pearson correlation at  $.643^{**}$ ). In both countries interviewees also referred to environmental benefits coming from the company (as it replaced agricultural land, degraded land, improved water quality and trees are a valued land use). In the case of MHP people were also identifying value added coming from the plantation, meaning some local businesses that are supporting the plantation operation (see: Figures 6.12 (A) and 6.18 (A)).
- v. Neoliberal paradigm plantations in both countries have top-down decision making systems and hierarchical power structures. The interviewees were always receiving directions from their supervisors, and referred to the centralized company authority as the ultimate source of decision power. However in Paraguay feedback from different levels is coming to the centre due to the suggestion boxes that are located at the plantation sites. This proved to be a successful way to get anonymous feedback and adapt the decisions to the current situation.
- vi. As the Figure 6.3 (A) shows, both companies possess a monopoly over knowledge and expertise related to the plantations. The neoliberal paradigm is negatively correlated with all other sources of knowledge expect of the company's knowledge where it shows a strong significant correlation (Pearson correlation at  $.455^{**}$ ).
- vii. In both cases the capital for the plantation is connected to foreign investors, Argentinian for POMERA and Japanese for MHP.
- viii. Plantation growth rates on both plantations are very high due to scale and intensive management with modern technology. For POMERA the considered MAI for *Eucalyptus*

*grandis* and *E. grandis x urophylla* is 40 m<sup>3</sup>/ha/year (with a rotation of 12-14 years), for MHP the MAI of *Acacia mangium* is classified in three groups depending on location and soil properties: high: 25-30 m<sup>3</sup>/ha/year, medium: 20-25 m<sup>3</sup>/ha/year, low: 15-20 m<sup>3</sup>/ha/year. Here the rotation is only 6 years.

- ix. The neoliberal paradigm plantations show surprisingly high performance in social indicators. However it is mostly due to the best performance in the work safety and work standard cluster. In other clusters POMERA from Paraguay has highly valued human resources policy and assures a broad range of social services. Both plantations have moderately positive participation performance that took into account membership in organizations, training programs, land use planning and access to information. However strict participation disaggregated from the cluster was low and has been discussed in the previously discussed point iii about local involvement (see: Figures 6.11 (A) and 6.17 (A)).
- x. Economic performance of plantations under the neoliberal paradigm is not that high as expected. Both plantations are very well connected to the markets. However both have problems with economic long-term stability due to general problems with the environment for investments. Profitability in the Indonesian MHP plantation is limited. This is due to the vertical integration of the pulp and paper industry – where high profitability is not assured at the plantation level. Plantation benefits are also quite constrained for both case studies (see: Figures 6.11 (A) and 6.17 (A)).
- xi. Environmental performance of both plantations is quite limited. For both cases certification standards and soil measures are highly valued, but environmental threats and habitat loss are common environmental problems. In Paraguay plantation material is considered as problematic and so are the water effects of *Eucalyptus*. In Indonesia such a big plantation land use change is considered as environmentally undesirable (see: Figures 6.11 (A) and 6.17 (A)).

## NEOLIBERAL MODIFIED PARADIGM

### Assumptions

Typical outgrower-scheme plantation has been identified in Paraguay but has not been identified in Indonesia. Plantations that are supposed to be organized according to the outgrower scheme characteristics in Indonesia, were in fact land rentals from private land owners, where the full responsibility and plantation management and work have been executed by the companies. Therefore the case selected for analysis is:

- *Case study III Out-grower schemes in Itapua, Paraguay*

PARADIGM (approximate period)	Land Ownership/ Forest Management	Understandings / Goals of Plantations	Governance	Knowledge and Expertise	Capital Source / Potential Growth Rate
5.b NEOLIBERAL MODIFIED (ca. 1990 – present)	Exclusive, with partnerships agreements  Outgrower schemes	Profit	Top-down with participatory elements	International Scientific Forestry, Local Knowledge	Private sector investments with farmers contribution (land)  Can reach the growth rate of neo-liberal, although usually lower

**Table 6.4 (A)** - Brief characteristics of the neoliberal modified paradigm in forest plantations

<p>Assumptions for the neoliberal modified paradigm in forest plantations are:</p> <ol style="list-style-type: none"> <li>i. The neoliberal modified paradigm in forest plantations should be nationally empowered since the 1990s</li> <li>ii. It is expected to correspond to medium plantation areas, with private land titles, and with limited land conflict due to special voluntary agreements between stakeholders</li> <li>iii. It should be characterized by a relatively high local involvement in decision-making and membership in local organizations</li> <li>iv. It should offer a wider range of local benefits compared to the pure neoliberal paradigm</li> <li>v. It is expected to offer complex governance patterns with both hierarchical and participatory elements</li> <li>vi. Knowledge and expertise should come predominantly from international scientific forestry and company guidelines but may be enriched with local knowledge and practices</li> <li>vii. Capital for the plantations should come directly from the investing companies but other assets (land, labor) are to be provided by contracted partners</li> <li>viii. Plantation growth rates are expected to be high, although due to some obstacles (fragmented parcels, more dispersed duties) can be lower than in the pure neoliberal paradigm plantations</li> <li>ix. The neoliberal paradigm should have a stronger performance of the social indicators than the pure neoliberal paradigm</li> <li>x. Economic performance of plantations under the neoliberal paradigm should be successful in absolute terms and also in wealth distribution between the stakeholders</li> <li>xi. Environmental performance of plantations under the neoliberal modified paradigm should be limited but better compared to the pure neoliberal paradigm (mosaic land use at the landscape scale)</li> </ol>
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## Observations

- i. Plantations organized on the outgrower scheme model started in the cooperative *Colonias Unidas* in the year 2000 as a novel form to assure energy security.
- ii. The individual visited plantation plots varied between 0,75 - 250 hectares and the median was 3,5 hectares. This is a bigger land size than projects discussed under the social paradigm, and definitely smaller than the plantations that correspond to the neoliberal paradigm. All plantations were with clear land titles and land conflict has been mentioned only by one stakeholder (with worries about legal security of land with the changing political situation in the country).
- iii. In fact, local involvement in decision-making and membership in local organizations in the outgrower scheme is much higher than in the companies organizing plantations and only a little bit lower than in pure smallholder plantation projects (see: Figure 6.2 (A)).
- iv. Stakeholders list three types of local benefits resulting from the outgrower scheme (income, local construction material from wood and environmental services delivered by plantations) what is more than in case of the Paraguayan company POMERA (employment and environmental services) but less than in the pure smallholder plantations where trees are praised for numerous local benefits (see: Figure 6.10 (A)).
- v. Plantation governance is a resultant of the owner's priorities and obligations coming from the contract with the cooperative. Usually the owner needs to provide a certain amount of wood in a given time but can introduce some adaptations depending on his/her interest (e. g. regarding agroforestry) and can freely decide what to do with the surplus wood (sell to the cooperative as well, sell on the market, use for the household construction, extend the rotation time of 7 years etc.).
- vi. Although knowledge and expertise in outgrower schemes should have possible multiple sources, in outgrower schemes organized by the cooperative *Colonias Unidas*, the cooperative is the only actor with such a role (Pearson correlation with the expert knowledge from the cooperative/association at ,358\*\*). This may be a result of no



interference from the national institutions, academia and also lack of local knowledge as tree planting is a relatively new activity in the area (see: Figure 6.3 (A)).

- vii. Capital for the plantations is coming from the cooperative as interest-free loans that are repaid by plantation owners after the final cut. Plantation owners dedicate their land and labor and after the realization of the plantation lifespan repay the loan with wood (about 1/3 of the standing volume) and decide where to sell the wood surplus (about 2/3).
- viii. Plantation growth rates are high with MAI for fuelwood at about 30 m<sup>3</sup>/ha/year (on a 7 years rotation). The neoliberal modified paradigm is positively correlated with big production potential (Pearson correlation at ,294\*\*).
- ix. The neoliberal modified paradigm has a very strong social performance and a very balanced one. It can effectively address the participation issues, access to services, and management of human resources but also work safety and other work related standards (see: Figure 6.9 (A)).
- x. Economic performance of the outgrower schemes is successful in absolute terms and also in wealth distribution between the stakeholders (see: Figure 6.9 (A)).
- xi. Environmental performance is much weaker compared to the social and economic clusters. It is weak in environmental standards (no interest in certification etc.), it complies with the basic national laws. There is no interest in native species, any advanced soil and chemical management. Also the habitat functions of the exotic monoculture managed on a short rotation are limited (see: Figure 6.9 (A)).

## GLOBAL POLITICAL PARADIGM

### Assumptions

From the globally empowered constructs on plantations, one regarding climate change is highest on the political agenda and its outputs on the ground are the Clean Development Mechanism plantations. However the actual number of such plantations that have already successfully undergone validation is very low.

PARADIGM (approximate period)	Land Ownership/ Forest Management	Understandings / Goals of Plantations	Governance	Knowledge and Expertise	Capital Source / Potential Growth Rate
GLOBAL POLITICAL (1992-present)	Project dependent, i.e. state, private, Lease agreements.  Project-defined, according to developed standards	Climate Change Global	UNFCCC	Political framing, International Experts, Negotiations, Global priorities	Private and state investors  Still unclear (few and recent projects, i.e. CDM)

**Table 6.5 (A)** - Brief characteristics of the global political paradigm in forest plantations

As this project asks about the performance of studied plantations, the cases selected need to be plantations where trees have been already planted some years ago and where the performance of such plantations and their local role can be studied. Therefore only one plantation from Paraguay has been able to fulfil the case selection criteria. In Indonesia, CDM projects are just starting and much more promoted REDD projects do not concentrate on tree-planting activities at their core. Under these circumstances, the case study corresponding to the global political paradigm is:

- *Case study II Smallholder plantation with Clean Development Mechanism, Paraguari Department, Paraguay*

<p>Assumptions for the global political paradigm in forest plantations are:</p> <ol style="list-style-type: none"> <li>i. The global political paradigm in forest plantations should be nationally empowered since the 1992</li> <li>ii. It is expected to correspond to small and medium plantation areas and diverse land arrangements that are project-defined. Due to the big emphasis on the social acceptance, such plantations should not create land conflicts and should promote diversified land use on plantation sites (with different forms of agroforestry, silvopasture etc.)</li> <li>iii. It should be characterized by high local involvement in decision-making and membership in local organizations</li> <li>iv. It should promote responsible forestry with a wider range of local benefits compared to the other paradigms, but with a big emphasis on climate, environmental and social issues</li> <li>v. It is expected to offer horizontal governance without hierarchical power structures</li> <li>vi. Knowledge and expertise should have multiple sources and external knowledge should be adapted to the local needs</li> <li>vii. Capital for the plantations should come from external investors and development projects</li> <li>viii. Plantation growth rates are expected to be small/ moderate due to their small scale and common selection of agroforestry systems</li> <li>ix. The global political paradigm should have a good performance in the social indicators</li> <li>x. Economic performance of plantations under the global political paradigm should be weak in absolute terms, but equally distributed and enhanced by carbon credits selling</li> <li>xi. Environmental performance should be particularly good, apart from their climate change mitigation role, they should address many local environmental issues</li> </ol>
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## Observations

- i. The CDM project in Paraguay was launched by the Japan International Research Center for Agricultural Sciences (JIRCAS) with the cooperation of the National Forestry Institute (INFONA) in 2003. It is based on a complicated methodology allowing for obtaining of the carbon emission reduction certificates (CERs).
- ii. The interviewed smallholders possessed plantations in sizes ranging from 0.5 to 2 hectares, with a mean of 0,82 and median of 0,75 hectares. The official total project area of 215.2 hectares decreased to less than 200 hectares as some families withdrew from the project. As the project has been prepared and implemented in a participatory way, stakeholders did not identify any conflicts. Plantation land use is non-exclusive and adapted to the particular family needs (species, intercropping, green manure etc.).
- iii. Local involvement in the project is quite high, not that high as in typical smallholder plantations but definitely higher than in plantations managed by companies. This medium involvement may be explained with a very limited general organizational level in the area and also with the difficulties for the local populations to understand the whole rationale and conditions of the project (see: Figure 6.2 (A)).
- iv. The CDM plantation project clearly links the forestry activities to the local needs and particularities. It is addressing the local fuelwood shortage in the region and local problems with soil erosion and unproductivity. The graphs show that according to the stakeholders, the plantation provides a wide range of local benefits (income, fuelwood, environmental services, saving accounts, local construction material and possibilities for value added as beekeeping in the early stage and maybe other related services later on). Stakeholders also point to the global benefits resulting from the project (preventing global warming, providing oxygen, increasing the global timber supply and general improvement of the global environment). However, deeper interviews show that the stakeholders have no understanding regarding the global climate change issue and completely no regarding carbon storage (see: Figures 6.7 (A) and 6.8 (A)).

- v. Plantation decision-making in the CDM project started with the local hearings and for every project member deciding to establish a plantation an individual plan has been prepared. However, once joining the project plantation owners have certain obligations – the cutting period for *Eucalyptus* is 12 years and for *Grevillea* 20 years. In the meantime the owner profits from thinning that is also defined in the project. This horizontal governance, where project stakeholders are equal parties eliminated any plantation related conflicts. However the result is that some plantation owners do not respect the project's obligations. The outgrower scheme contract seemed to be better implemented and accepted compared to the CDM contracts.
- vi. Knowledge and expertise regarding the plantation come only from the project (there is no local knowledge that could be used for plantation management) and no other knowledge sources in the area. However it must be admitted, that the practices are clearly adapted to the local peculiarities (especially soil management techniques) (see: Figure 6.3 (A)). It shows the strongest correlation among other plantations to the cooperation with national and foreign universities (Pearson correlation at .545\*\* and .872\*\*).
- vii. The project is financed by the external actors, mainly the Japan International Research Center for Agricultural Sciences (JIRCAS) with some technical and administrative help from National Forestry Institute (INFONA). The carbon credits will be also divided between the donors and will probably not pay back the project's costs. The detachment of carbon credits from the local tree owners may be one of the reasons for a limited understanding of the initiative on the ground.
- viii. The expected growth rates for the plantation are moderate, with MAI for *Eucalyptus* up to 20 m<sup>3</sup>/ha/year and for *Grevillea* up to 10 m<sup>3</sup>/ha/year MAI (rotation *Eucalyptus*: 12 years, *Grevillea*: 20 Years). It is less than the industrial companies can achieve with similar plantations but still quite a good performance for plantations that are cared by various owners and that have various goals to fulfil.
- ix. The global political paradigm has a positive performance of social indicators, with the biggest shortcomings in work safety. Work safety has not been promoted and is neglected by the participants (similarly to the social paradigm plantations). Although the trees are

still young, and there were no accidents so far, it may be a future problem (see: Figure 6.6 (A)).

- x. Economic performance of the plantation shows a positive benefit distribution and a positive profitability. However the market access is a problem in the area and generally the environment for plantation investments is not very promising (see: Figure 6.6 (A)).
  
- xi. Environmental performance of plantations under the global political paradigm is not much better compared to the other plantations. Plantation material provided by INFONA is not good enough, roads in the area will not be able to cope with wood transportation, people refer to big habitat decrease in the area in their life memory and no certification is considered. However the EIA has been carried out, what is not common for such plantations, there are no chemicals used on the plantation, they usually replace marginal agricultural land, have positive water effects and no environmental threats affected the plantations so far (see: Figure 6.6 (A)).

### 6.1.3 Summary of confirmed and unobserved elements

Based on the discussed comparison between the initial assumptions and case study observations of all studied paradigms, the following summary can be proposed.

<b>ASSUMPTIONS VS OBSERVATIONS</b>			
<b>Confirmed assumptions</b>	<b>Partly divergent observations</b>	<b>Unexpected observations</b>	
<b>INDUSTRIAL NATIONAL PARADIGM</b>			
Historical context	Local knowledge additional to the company's expertise	Moderate economic performance	
Land issues and conflicts			
Local involvement			
National benefits			
Top-down governance			
Capital source			
Moderate MAI			
Poor social performance			
Moderate environmental performance			
<b>SOCIAL PARADIGM</b>			
Historical context	Knowledge and expertise (sometimes limited, Paraguay)	Poor environmental performance	
Land issues			
Local involvement			
Local benefits	Growth rates (MAI higher and better than expected, Indonesia)		
Horizontal governance			Poor work safety
Capital source			
Strong social performance			
Moderate economic performance			
<b>NEOLIBERAL PARADIGM</b>			
Historical context		Strong social performance	
Land issues and conflicts			
Local involvement			
Local benefits			
Top-down governance			
Monopoly over knowledge			
Capital source			
High MAI			
Poor environmental performance		Moderate economic performance	
<b>NEOLIBERAL MODIFIED PARADIGM</b>			
Historical context	Poor environmental performance	Very strong social performance	
Land issues and limited conflicts			
Local involvement			
Local benefits			
Balanced governance			
Capital source	Limited sources for knowledge and expertise		
High MAI			
Strong economic performance			
<b>GLOBAL POLITICAL PARADIGM</b>			
Historical context	Local involvement only moderate	Moderate social performance	
Land issues and limited conflicts			
Local and global benefits			
Horizontal governance			
Capital source			
Moderate MAI			
Weak economic performance but equally distributed		Moderate environmental performance	
	Limited sources of knowledge and expertise		

**Table 6.6 (A)** - Summary of the paradigm fit

### 6.1.4 Correlation analysis

The table below shows the results from the Pearson correlation analysis conducted between the paradigms and studied indicators that was referred to in the analysis.

Paradigm	Participation score	Local means of savings	Local source of employment	National export	Expert knowledge based on local knowledge	Expert knowledge from cooperative or association	Expert knowledge from external project
Neoliberal Paradigm	<b>-,389**</b> ,000 123	-,081 ,189 120	<b>,643**</b> ,000 120	,040 ,330 122	-,181* ,023 123	-,293** ,001 123	-,206* ,011 123
Industrial National Paradigm	<b>-,612**</b> ,000 123	-,127 ,083 120	,075 ,209 120	<b>,204*</b> ,012 122	-,114 ,105 123	-,486** ,000 123	-,342** ,000 123
Neoliberal-Modified Paradigm	,086 ,173 123	-,108 ,121 120	-,126 ,085 120	-,106 ,123 122	-,240** ,004 123	<b>,358**</b> ,000 123	-,273** ,001 123
Global Political Paradigm	-,195* ,015 123	-,012 ,448 120	-,126 ,085 120	-,106 ,123 122	-,240** ,004 123	-,388** ,000 123	,508** ,000 123
Social Paradigm	<b>,743**</b> ,000 123	<b>,217**</b> ,009 120	-,228** ,006 120	-,036 ,347 122	<b>,495**</b> ,000 123	<b>,545**</b> ,000 123	<b>,216**</b> ,008 123

Paradigm	Expert knowledge from national institutions	Expert knowledge from company	expert knowledge from book and materials	Cooperation with national university	Cooperation with international (foreign) university	Support from the state	Production potential
Neoliberal Paradigm	-,064 ,242 123	<b>,455**</b> ,000 123	-,052 ,286 123	,209* ,011 121	,225** ,006 123	-,217* ,011 111	,133 ,072 123
Industrial National Paradigm	-,106 ,122 123	,708** ,000 123	-,086 ,173 123	<b>,312**</b> ,000 121	-,199* ,013 123	<b>,234**</b> ,007 111	,338** ,000 123
Neoliberal-Modified Paradigm	-,084 ,177 123	-,008 ,464 123	-,068 ,226 123	-,259** ,002 121	-,159* ,039 123	-,289** ,001 111	<b>,294**</b> ,000 123
Global Political Paradigm	-,084 ,177 123	-,230** ,005 123	-,068 ,226 123	<b>,545**</b> ,000 121	<b>,872**</b> ,000 123	-,289** ,001 111	-,770** ,000 123
Social Paradigm	<b>,225**</b> ,006 123	-,623** ,000 123	<b>,182*</b> ,022 123	-,530** ,000 121	-,431** ,000 123	,383** ,000 111	-,017 ,427 123

Table 6.7 (A) – Selected results from the correlation analysis

\*\* correlation is significant at the 0.01 level (1-tailed)

\* correlation is significant at the 0.05 level (1-tailed)

## ZUSAMMENFASSUNG

Die vorliegende Studie analysiert die Politische Ökonomie von Forstplantagen in den Tropen. Die Analyse der Makroebene zeigt dabei eine globale Perspektive auf, sowie historische Veränderungen von Paradigmen in Bezug zu Waldplantagen. Der zweite Teil der Studie analysierte Plantagen auf der Mikro-Ebene im Hinblick auf divergente geographischen Zusammenhänge, nämlich Paraguay und Indonesien. Fallstudien eignen sich hierbei, um ein vielfältiges Spektrum von Waldplantagen darzustellen, sowie Beispiele für die in der Makroebene abgeleiteten Paradigmen zu illustrieren. Abschließend verbindet die Studie die Entwicklungen der Makro-Ebene mit Belegen aus der Mikro-Analyse. Hierauf ableitend werden Empfehlungen für die Anlage zukünftiger Plantagen getätigt.

Die Methodik wurde den Untersuchungsebenen in einem iterativen Prozess angepasst. Der Umfang variiert dabei von Makro- bis Mikroanalysen, sowie vom theoretischen bis zum empirischen Niveau. Auf der Makroebene wurde eine Politische-Ökonomie-Analyse und eine Untersuchung des relevanten historischen Materials durchgeführt. Weiterhin wurden Plantagen Paradigmen anhand ausgewählter Indikatoren abgegrenzt. Für die Mikroebene wurden Fallstudien mit lokalen Interviews durchgeführt, welche Daten für eine Mehrkriterienanalyse (MCA) lieferten. Die Kombination der Mikro- und Makroanalyse erfolgte durch eine Korrelationsanalyse und wurde durch eine Diskussion abgerundet.

Das Forschungsergebnis aus der globalen Analyse ist eine **Typologie von sechs Paradigmen** und deren Untervarianten, welche als theoretisches und analytisches Werkzeug in der Forschung zu Plantagen dienen können. Die Paradigmen wurden klassifiziert als: i) das vorindustrielle P.; ii) das kolonial industrielle und national industrielle; iii) das Schutzparadigma; iv) das soziale P.; v) das neo-liberale und modifiziert neoliberale P. und vi) das globalpolitische Paradigma.

Die Ergebnisse der Fallstudien und MCA zeigen zum einen sichtbare Mängel in Plantagen unter verschiedenen Paradigmen auf und unterstreichen zum anderen positive Effekte bestimmter Paradigmen. Die MCA Bewertungspunkte zeigen zum Beispiel, dass manche Paradigmen mit dem Kriterium Landkonflikt korrelieren, oder präsentieren unterschiedliche lokale Beteiligung auf verschiedenen Plantagen, illustrieren Vorteile, die Plantagen für unterschiedliche Interessengruppen bringen. Die MCA bewertet weiter die Wirtschaftsleistung der Plantagen und vergleicht Faktoren, wie Nutzenverteilung, Rentabilität, Marktzugang und Rahmenbedingungen für Investitionen. Sie analysiert soziale Faktoren, wie Arbeitssicherheit, Zugang zu Dienstleistungen, Beteiligung oder Personalmanagement. Weiterhin werden Umweltprobleme durch die Studie aufgegriffen, z.B. Landnutzungsänderungen, Wasser- oder Boden- Auswirkungen, Lebensraumfunktion usw. Wie die vergleichende Analyse zeigt, **ist die modifizierte Neoliberale Paradigma Plantage (Outgrower-Scheme) besonders geeignet, um sowohl soziale als auch wirtschaftliche Vorteile zu sichern (90 % und 84 % in den entsprechenden Feldern gegenüber dem hypothetischen Idealtyp Plantage)**. Andere Forschungsergebnisse deuten auf wichtige Erkenntnisse bei der Plantagenentwicklung hin, die auf der Plantagen-Ebene und bei der Gestaltung nationaler Rahmenbedingungen für den Plantagensektor berücksichtigt werden sollten. Handlungsempfehlungen für die forstwirtschaftliche, epistemische Gemeinschaft zur Gestaltung der weiteren Diskurse in Bezug auf globalen Plantagen werden ebenfalls diskutiert.

### **Schlüsselworte:**

Forstplantagen, Paradigma, Paradigmenwechsel, Politische Ökonomie, Geschichte der Plantagen, Paraguay, Indonesien, Mehrkriterienanalyse (MCA)



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2. Bei der Auswahl und Auswertung des Materials sowie bei der Herstellung des Manuskripts habe ich Unterstützungsleistungen von meinen wissenschaftlichen Mentoren erhalten: Prof. Jürgen Pretzsch und Dr. Laura Secco.
3. Weitere Personen waren an der geistigen Herstellung der vorliegenden Arbeit nicht beteiligt. Insbesondere habe ich nicht die Hilfe eines kommerziellen Promotionsberaters in Anspruch genommen. Dritte haben von mir weder unmittelbar noch mittelbar geldwerte Leistungen für Arbeiten erhalten, die im Zusammenhang mit dem Inhalt der vorgelegten Dissertation stehen.
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Oslo, 29.09.2014



Julia Szulecka