

# Rattan futures in Katingan: why do smallholders abandon or keep their gardens in Indonesia's 'rattan district'?

---

Viola Bizard



**World  
Agroforestry  
Centre**



# Rattan futures in Katingan: why do smallholders abandon or keep their gardens in Indonesia's 'rattan district'?

---

Viola Bizard

Working Paper no.175



**Correct citation**

Bizard V. 2013. *Rattan futures in Katingan: why do smallholders abandon or keep their gardens in Indonesia's 'rattan district'?* Working Paper 175. Bogor, Indonesia: World Agroforestry Centre (ICRAF) Southeast Asia Regional Program. 23p. DOI: 10.5716/WP13251.PDF

Titles in the Working Paper Series share interim results on agroforestry research and practices to stimulate feedback from the scientific community. Other publication series from the World Agroforestry Centre include agroforestry perspectives, technical manuals and occasional papers.

Published by the World Agroforestry Centre  
Southeast Asia Regional Program  
PO Box 161, Bogor 16001  
Jawa Barat  
Indonesia

Tel: +62 251 8625415  
Fax: +62 251 8625416  
Email: [icraf-indonesia@cgiar.org](mailto:icraf-indonesia@cgiar.org)  
Website: [http://worldagroforestry.org/regions/southeast\\_asia](http://worldagroforestry.org/regions/southeast_asia)

© World Agroforestry Centre 2013

**Disclaimer and copyright**

The views expressed in this publication are those of the authors and not necessarily those of the World Agroforestry Centre. This publication may be quoted or reproduced without charge, provided the source is acknowledged. All images remain the sole property of their source and may not be used for any purpose without written permission of the source.

## About the author

**Viola Bizard** is a PhD candidate in social anthropology at the School of Anthropology and Conservation at the University of Kent in Canterbury, United Kingdom, with particular interest in environmental anthropology. Since August 2012, she has been conducting long-term fieldwork in Katingan district, Central Kalimantan province, Indonesia. Part of this research is within the scope of a fellowship at the World Agroforestry Centre. Before commencing her PhD studies, she worked as lecturer and research assistant at the Institute of Social Anthropology and the Department of International Politics at Freiburg University, Germany, where she graduated in social anthropology (MA) and political science (MA) in 2011. Apart from the fieldwork in Central Kalimantan, she draws on research experience in Sumatra and Java in Indonesia as well as her work for the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) in Viet Nam, all of which centred on the complex relations of humans with their environment.

## **Abstract**

This study addresses the question of why smallholders in Katingan abandon or keep their rattan gardens in Indonesia's 'Rattan District'. During 2003–2013, Katingan district has the official vision of becoming the centre of rattan production and trade in Indonesia. With support from the national government, Katingan strives to develop the local rattan industry and, thus, seeks to turn rattan cultivation into an attractive commodity for local livelihoods, as has been envisioned by non-governmental organisations (NGOs) as well. In the context of these visions, predictions, futures surrounding the 'social life' of rattan in Katingan, this paper seeks to understand the situation on the ground. Rather than exploring these diverse visions, their associated initiatives and any gaps between vision and practice, the author asks, 'Do people in Katingan abandon their rattan gardens or not? Why? And, since people's decision making is at the interface of past experience, present conditions and an anticipated future, what vision do smallholders in Katingan hold for their rattan gardens?'

**Keywords:** rattan, Katingan, vision, livelihoods, Indonesia

## Acknowledgements

The opportunity for me to conduct this research was made possible by the generous support of various individuals and institutions, to whom I would like to express my thanks.

The Studienstiftung des deutschen Volkes (German National Academic Foundation) provided me with funds to conduct the PhD research. Additional support has been granted by the World Agroforestry Centre. Thank you to my supervisor at the Centre, Dr Meine van Noordwijk, and colleagues for inviting me to become a fellow at their institution and providing technical assistance, particularly with regard to ecological aspects.

My supervisors at the School of Anthropology and Conservation at the University of Kent, Dr Judith Bovensiepen and Dr Rajindra K Puri, have given guidance, inspiration and emotional support during the process of preparing the research and the fieldwork itself. As committee member, Prof Dr Roy Ellen's outstanding experience in human–environment interactions has been of utmost value.

Within the scope of a memorandum of understanding with the School of Anthropology, the Institute of Ecology at Padjadjaran University, Bandung, Indonesia, is sponsoring my research. Thank you to Prof Dr ErriNoviarMegantara, Prof Dr Johan Iskandar and Dr Dr med. Setiawan for making this possible. Budi Widarsa Surya kindly takes care of administrative matters.

Discussion and cooperation with colleagues from the Center for International Forestry Research and the Indonesian Forestry Research and Development Agency is providing valuable insight into the rattan issue. Thank you also to staff members of the World Wide Fund for Nature's Central Kalimantan office and the Non-Timber Forest Product Exchange Programme for inviting me to join their activities.

My thanks also go to officials of the Forestry Office, the Office of Industry and Trade, the Development and Planning Agency, the National Land Agency and the Office of Social Affairs, Manpower and Transmigration in Katingan district, who have always been helpful in providing data and allowing me to take part in government workshops related to rattan.

Thank you to Rut DiniPrasti from Palangka Raya University, Akbar Rizki from the Institute of Agriculture in Bogor as well as RunaviaMulyasari and Des Christy from the Department of Anthropology at Gadjah Mada University in Yogyakarta for their help in data processing.

Last but not least, my gratitude goes to the people of Tumbang Runen and Tumbang Malawan, whose hospitality and tolerance to let me join in their everyday routines are invaluable. Special thanks to Mohammad Effendi, whose understanding and curiosity to learn about his own culture is invaluable for this research. By sharing their knowledge and stories with me, the people of Tumbang Runen and Tumbang Malawan have allowed me to glimpse the world of rattan farmers in Katingan.



# Contents

|   |           |
|---|-----------|
| <b>1. Introduction: envisioning rattan.....</b>                     | <b>1</b>  |
| <b>2. Methodology .....</b>   | <b>2</b>  |
| <b>3. What are rattans? .....</b>                                   | <b>4</b>  |
| 3.1 Kalimantan’s rattan gardens .....                               | 5         |
| <b>4. Katingan: geographical and ethnographic overview .....</b>    | <b>6</b>  |
| 4.1 Tumbang Runen .....   | 7         |
| 4.2 Tumbang Malawan .....   | 8         |
| <b>5. Why do farmers abandon or keep their rattan gardens?.....</b> | <b>9</b>  |
| 5.1 Reasons for not harvesting .....                                | 12        |
| 5.2 Rubber: the new hope .....                                      | 14        |
| 5.3 Swiddening and engagement with land .....                       | 16        |
| 5.4 Ways of obtaining rattan gardens .....                          | 16        |
| 5.5 Smallholders’ visions .....                                     | 18        |
| <b>6. Concluding remarks .....</b>                                  | <b>20</b> |
| <b>References.....</b>  | <b>21</b> |

# List of figures

|   |    |
|---|----|
| <b>Figure 1.</b> Interdependent endogenous and exogenous factors possibly affecting land-use decisions..... | 3  |
| <b>Figure 2.</b> Rattan genera, number of species and their distribution.....                               | 4  |
| <b>Figure 3.</b> Map of Katingan district.....  | 7  |
| <b>Figure 4.</b> Ownership of rattan gardens.....   | 9  |
| <b>Figure 5.</b> Planting activities in the last three-to-four years.....                                   | 10 |
| <b>Figure 6.</b> Planting activities in 2009 and earlier.....   | 10 |
| <b>Figure 7.</b> Sale and land-use change.....  | 11 |
| <b>Figure 8.</b> Sale and land-use change according to purpose.....   | 11 |
| <b>Figure 9.</b> Reasons for not harvesting.....  | 12 |
| <b>Figure 10.</b> Harvesting activities.....  | 13 |
| <b>Figure 11.</b> Sensual experience of rattan harvesting.....  | 14 |
| <b>Figure 12.</b> Ownership of rubber gardens.....  | 15 |
| <b>Figure 13.</b> Planting activities in 2012/13 swidden cycle in Tumbang Malawan.....                      | 15 |
| <b>Figure 14.</b> Rice swiddening in the last three years.....  | 16 |
| <b>Figure 15.</b> Ways of acquiring rattan gardens.....   | 17 |
| <b>Figure 16.</b> Reasons for keeping rattan gardens.....   | 18 |
| <b>Figure 17.</b> Interest in land-use change.....  | 19 |
| <b>Figure 18.</b> Rattan futures.....   | 19 |

## Abbreviations and glossary

|                        |  |
|------------------------|--|
| <i>adat</i>            | Indonesian: local custom or law  |
| <i>dawah</i>           | Ngaju Dayak: flat, fertile areas along the river   |
| <i>hati rakyat</i>     | Indonesian: ‘hearts of the people’, that is, votes of the people                           |
| <b>HPH</b>             | Indonesian: Hak Penguasaan Hutan (logging concession)                                      |
| <b>IKEA</b>            | the world’s largest furniture manufacturer   |
| <b>IPB</b>             | Institut Pertanian Bogor (Bogor Agricultural Institute)                                    |
| <b>IDR</b>             | Indonesian rupiah  |
| <i>jatun rega</i>      | Ngaju Dayak: ‘there is no price’   |
| <i>kabon uei/uwei</i>  | Ngaju Dayak: ‘rattan garden’   |
| <i>kereng</i>          | Ngaju Dayak: land areas of higher altitude, safe from flooding                             |
| <b>KpSHK</b>           | Konsorsium pendukung Sitem Hutan Kerakyatan (Consortium for Supporting Community Forestry) |
| <i>maneseng</i>        | Ngaju Dayak: ‘to rejuvenate’   |
| <b>NGO</b>             | Non-governmental organization  |
| <b>NTFP</b>            | Non-timber forest product  |
| <b>NTFP-EP</b>         | Non-Timber Forest Product Exchange Programme   |
| <b>REDD+</b>           | Reducing Emissions from Deforestation and Forest Degradation plus conservation             |
| <i>tebang banjir</i>   | Ngaju Dayak: ‘flood logging’   |
| <i>uei/uwei</i>        | Ngaju Dayak: ‘rattan’  |
| <i>umba rayan uluh</i> | Ngaju Dayak: ‘to follow the season of people’, that is, to follow others                   |
| <i>warisan</i>         | Indonesian: ‘inheritance, legacy’  |
| <b>WWF</b>             | World Wide Fund for Nature   |

## Quotes

*The vision of Katingan district is 'Katingan as the production and trade centre of rattan in Indonesia'.*

Duwel Rawing 2008: VI-2, District Head of Katingan 2003-2013

*Let's campaign rattan! RATTANATION: for the nation, sustainable forests and local people's livelihoods.*

Consortium for Supporting Community Forestry

*Greening the future: certification could be an option!*

Non-Timber Forest Products Exchange Programme

*Sustainable rattan [...] is also a way to safeguard ecosystem processes, species and human livelihoods that are tightly interlinked with the existence of this planet.*

World Wide Fund for Nature

*My prediction is that 15 years from now only 20% of the current rattan stock will remain.*

Rattan trader in Kasongan; interview 19.11.2012

*We all have rattan gardens, but people have become lazy to maintain them.*

Rattan smallholder in Katingan; pers. comm. 12.2011

*Rattan gardens could be a low-carbon economic growth option beyond REDD+.*

Meine van Noordwijk, World Agroforestry Centre; pers. comm. 12.2011

*The unique knowledge and skills required to collect, manage, and utilize rattan are declining rapidly [...] As older generations pass, ancient rattan traditions and irreplaceable ecological knowledge will likely vanish as well.*

Siebert 2012: 30

# 1. Introduction: envisioning rattan

The ‘social life’ of rattan in Katingan district in Central Kalimantan, Indonesia, displays diverse visions, predictions, futures. ‘Rattan’ is the common term for a large and complex group of climbing spiny palms that occur in Old World tropical forests, constituting the world’s most important agroforestry product (cf. Siebert 2012 p. 1).<sup>1</sup> For centuries, rattans have been used for tying, basketry, construction, medicine, food and miscellaneous purposes by local communities. Beyond that, rattans have been traded for their solid, strong and highly flexible canes, forming the basis of today’s thriving international industry that receives around 80% of its supplies from Indonesia.

Katingan district made its official vision for 2003–2013 to become the ‘production and trade centre of rattan in Indonesia’ (Rawing 2007). This policy needs to be understood not only as a political strategy to capture the *hati rakyat*, that is, the votes of rattan farmers during the elections for district head in 2003 and 2008, but also in the context of a macro-political vision of an economy of ‘added value’ as an alternative development paradigm in the aftermath of the Asian Financial Crisis. The policy involves, amongst other growth measures, banning raw material exports—including rattan raw material and semi-finished rattan products—which came into effect in January 2012. Moreover, in order to boost local (and ‘green’) industry development, the Minister of Industry selected Katingan as a rattan production centre and the Ministry of Forestry decided to set up a rattan cluster in Katingan as part of a wider strategy of non-timber forest product (NTFP) development.

Backed by the national government, the district government has developed an impressive masterplan for building the local rattan industry. Apart from that, diverse programs have been more or less successfully executed, for instance, an enquiry into rattan stocks, rattan reforestation, handicraft workshops, the resettlement of Javanese furniture-makers from Cirebon and the establishment of a state-owned factory that is supposed to produce rattan furniture. Hitherto there was a gap between the vision and practice of developing the rattan industry and turning rattan into an attractive commodity for local livelihoods, which has also been envisioned by several NGOs.

With the support of the Consortium for Supporting Community Forestry (Konsorsium pendukung Sitem Hutan Kerakyatan/KpSHK), a local NGO called Teropong was the first to establish a rattan initiative in Katingan. In 2005, it conducted a baseline survey of rattan farms in the district, facilitated the formation of three rattan cooperatives and campaigned for a ‘RATTANATION’ composed of rattan e-farmers whose livelihoods, land rights and bargaining power would be improved, not least through information technology. Over the years, Teropong has shifted its attention to alternative themes and the World Wide Fund for Nature (WWF) has taken the lead in supporting local rattan farmers. Motivated by its concern for protecting biodiversity, the conservation NGO seeks to revitalize the three rattan cooperatives and hopes the world’s largest furniture manufacturer, IKEA, will invest in the local industry. In addition, the Non-Timber Forest Products Exchange Programme (NTFP-EP) envisions farmers’ rattan to be certified through the Participatory Guarantee System (PGS). Certified rattan is considered a ‘green’ alternative to conventional rattan material, resulting in added value for farmers and, therewith, assuring the sustainable management of rattan resources.

<sup>1</sup> Although rattans are usually described as climbing palms, some species do not climb. Yet, since the reproductive features of these shrubby palms of the forest undergrowth link them with climbing species they are included in the rattan genera (Dransfield 2002).

From a different perspective, continuous supply of rattan raw material has also become a serious concern for local traders in Katingan. With the export ban on unfinished and semi-finished rattan material, which was followed by a price drop of 35–40% for semi-finished rattan and 25–40% for unprocessed rattan, local traders have difficulty obtaining raw material. Several traders, in fact, have ceased to buy rattan all together. Against this background, some traders predict a rather dark future for Katingan's rattan. Many rattan smallholders have switched profession or converted their rattan gardens to other land uses, reported a local rattan farmer from Katingan during preliminary research in December 2011.

Since rattan gardens, like agroforestry systems in general, fulfil various ecological functions—biodiversity conservation, hydrological regulation, soil protection, carbon sequestration and thus climate control (Asbjørnsen et al 2000 p. 24, Belcher et al 2005 p. 248)—the conversion of rattan gardens to other land uses is of wider concern. Research has shown that agroforestry systems are the land-use system most at risk in Indonesia, owing to conversion to monocultural tree crops, and should be integrated into any policy to reduce carbon emissions from deforestation and forest degradation (van Noordwijk et al. 2010 p. 23).

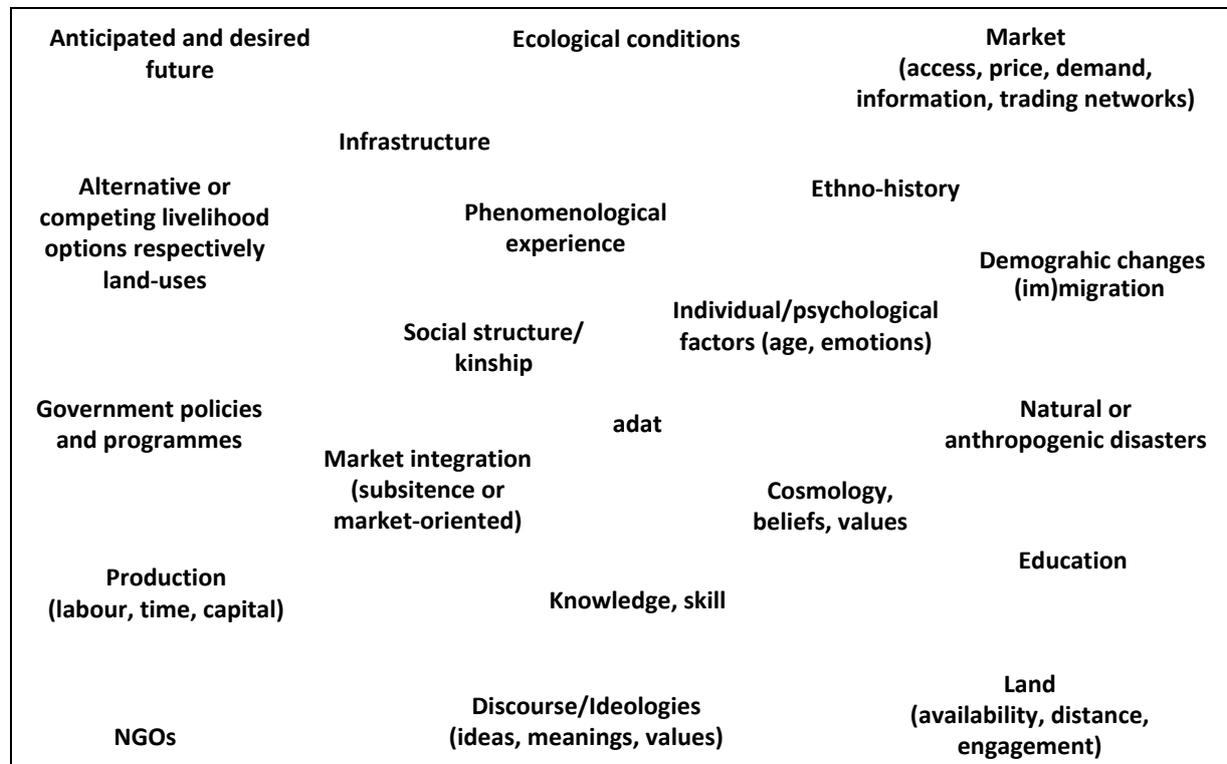
While from a climate perspective the loss of carbon sinks owing to the conversion of rattan gardens might be of primary concern, however, such a land-use change might go far beyond ecological repercussions. As Siebert (2012 p. 30) aptly notes in his reflection on the rattan cultures of Southeast Asia, vanishing rattan gardens might imply a transformation, or even loss, of people's culturally distinctive resource management practices, uses, meanings and values associated with the rattan—swidden complex and the resource itself, that is, the preconditions for sustainable rattan development and thus of the overall integrity of the natural environment in situ.

Against this background of multiple perspectives on the future of rattan in Katingan, an investigation seems plausible. But rather than explore these diverse visions, associated initiatives and any gap between vision and practice, this paper seeks to provide an understanding of the situation on the ground: 'Do people in Katingan abandon their rattan gardens or not? Why? And, since people's decision making is at the interface of past experience, present conditions and an anticipated future, what vision do smallholders in Katingan hold for their rattan gardens?' Integrating images of the future into the analysis allows for understanding present actions, livelihoods' conditions and perceptions of local rattan farmers in Katingan, particularly if coupled with an appreciation of the past.

## **2. Methodology**

This study follows a grounded, explorative approach. In line with event social science (Vayda 2009, Vayda and Walters 2011), concrete human actions at the village level—for example, converting a rattan garden—serve as starting points for exploring why farmers actively manage or abandon their rattan gardens. These specific actions can be explained by progressively contextualizing them forwards and 'backwards in time, either outwards in space, or through "densification" of context, inwards [...] and "up" in levels of society and governance' (McCay 2009 p. 15). This is not to say that 'anything goes', which would make things extremely relative. Rather, by being open and not a priori prioritizing some factors over others, one tries to reveal which endogenous and exogenous factors

affect the decision making of rattan farmers and, thus, *peu-à-peu* entangles the social–ecological complexity in which they operate (Figure 1).



**Figure 1.** Interdependent endogenous and exogenous factors possibly affecting land-use decisions

In order to trace the question at hand (as well as the objectives of the overall PhD project), I am conducting long-term fieldwork, August 2012–December 2013, mainly in villages in Katingan. The research, moreover, draws on five months of fieldwork in Katingan during 2009 and 2011. The study uses and pilots a mix of quantitative and qualitative methods, such as diverse interview techniques (structured, semi-structured, in-depth, expert interviews and focus-group discussions), participant observation, cultural domain analysis (freelisting, pilesorts, identification and ranking exercise), seasonal calendars or diaries. While some of these methods were used to explore other aspects of the PhD research than the question addressed here, often they nonetheless informed my overall understanding of livelihoods’ conditions and, thus, of local rattan management. For the analysis of the quantitative data, simple statistics were used. The qualitative data were transcribed, coded and analysed by means of NVivo software. However, as data collection is continuing not all data have been analysed yet and the findings presented thus need to be considered as preliminary.

Rather than presenting a complete overview on why farmers in Katingan abandon or keep their rattan gardens, the paper provides glimpses into two cases of rattan management in Katingan. The sites were selected owing to their variation in location, that is, lowland village versus upland village, implying also a difference in livelihoods’ activity; distance to the district capital; infrastructure; and religious background. This was designed to provide diverse insights into Indonesia’s self-proclaimed Rattan District.

### 3. What are rattans?

Rattans occur in the Old World tropical forests of Equatorial Africa, South and Southeast Asia, northern Australia and Fiji (Sunderland and Dransfield 2002). Belonging to the *Calamoideae* sub-family in the palm family (*Arecaceae*), a distinctive character of *Calamoideae* palms is their scaly fruit (Dransfield et al 2008 p. 141). Following a recent update on rattan genera, the number of species and their distribution (Figure 2), approximately 553 rattan species in 12 genera have been identified, of which *Calamus* and *Daemonorops* are the largest genera (Dransfield et al 2008 p. 141–207). Three genera (*Eremospatha*, *Laccosperma* and *Oncocalamus*) are endemic to Africa; the other nine genera occur primarily in the tropical forests of Southeast Asia (Dransfield et al 2008).<sup>2</sup>

| Genus                  | Species number | Distribution   |
|------------------------|----------------|--|
| <i>Calamus</i>         | ca. 374        | Equatorial Africa, Himalayas to south China, Malay Archipelago, north-eastern Australia and Fiji |
| <i>Daemonorops</i>     | 101            | India to southern China through Malay Archipelago to New Guinea and the Philippines              |
| <i>Ceratolobus</i>     | 6              | Malay Archipelago, Sumatra and Borneo  |
| <i>Eremospatha</i>     | 10             | Equatorial West and Central Africa   |
| <i>Korthalsia</i>      | Approx. 26     | Southeast Asia to New Guinea   |
| <i>Laccosperma</i>     | 5              | Equatorial West and Central Africa   |
| <i>Myrialepis</i>      | 1              | Southeast Asia and western New Guinea  |
| <i>Oncocalamus</i>     | 5              | Equatorial West Africa and Congo Basin   |
| <i>Plectocomia</i>     | Approx. 16     | Himalayas to southern China and Southeast Asia   |
| <i>Plectocomiopsis</i> | 5              | Southeast Asia and New Guinea  |
| <i>Pogonotium</i>      | 3              | Malay Archipelago and western Borneo   |
| <i>Retispatha</i>      | 1              | Borneo   |

**Figure 2.** Rattan genera, number of species and their distribution

Source: Dransfield et al 2008 p. 141–207

Rattan inventories have shown that Peninsular Malaysia and Borneo are home to the greatest abundance and diversity of rattans, with 146 species recorded so far for Borneo alone (for example, Dransfield 1992a1992b, van Valkenburg 2002).<sup>3</sup> Yet, despite burgeoning research into rattan taxonomy since the 1970s, two of the most prominent rattan botanists assess the rattan flora of both Africa and Southeast Asia as ‘poorly known’ (Sunderland and Dransfield 2002 p. 10). The lack of a comprehensive taxonomic base is considered critical not solely from a botanical point of view. Reliable data on rattan taxonomy is also essential for the conservation and sustainable development of

<sup>2</sup> The broad range of ecological niches in which rattans grow not only explains the wide geographic distribution and the abundance of species of rattan but also the high endemism occurring within this palm group (Siebert 2012 p. 10). Lowland and hill forests tend to have the highest rattan abundance and species diversity but the palms occur also across seasonally flooded swamp forests to high montane forests above 3000 m (Dransfield 2002). Detailed introductory information on rattan ecology is provided in Dransfield et al (2008 p. 141–207).

<sup>3</sup> Dransfield (2002) provides an overview on the state of rattan taxonomic knowledge by country.

the world's most significant, widely used and traded agroforestry product (cf. Dransfield and Manokaran 1994 p. 28, Siebert 2012 p. 20). While most rattan comes from 'wild' stocks, Hani people in southwestern China (for example, Xu 2007, Xu et al 2009) and different Dayak groups in today's Central and East Kalimantan in Indonesia have cultivated rattan as part of their rice–swidden system since long ago.

### 3.1 Kalimantan's rattan gardens

When rattan cultivation began in Kalimantan is unknown. Sources indicate that people in what is now Central and East Kalimantan have planted rattan since at least the mid-19<sup>th</sup> century (van Tuil 1929 cited in Pambudhi et al 2004 p. 349, Weinstock 1983 p. 60, Dransfield and Manokaran 1994 p. 34).<sup>4</sup> Different authors have documented Kalimantan's traditional rattan cultivation system (for example, Weinstock 1983, Mayer 1989, Godoy 1990, Godoy and Feaw 1991, Fried and Mustofa 1992, Fried 2000, Belcher 2001, Gönner 2001, Belcher et al 2004, Arifin 2003, Matius 2004, Sasaki 2007). Descriptions have been drawn of different sub-groups of the Luangan Dayak people living between the middle reaches of the Barito River in Central Kalimantan and the middle section of the Mahakam River in East Kalimantan. But no detailed account has been found of the cultivation system in Katingan. While the particularities of rattan cultivation differ from grower to grower and place to place, the basic features of the system seem to be similar.

Rattan cultivation is closely intertwined with swidden agriculture. Farmers plant rattan seeds—mostly *uei/uwei sigi* (in Ngaju Dayak. Indonesian: *rotan sega/taman*. *Calamus caesius*) and *uei/uwei irit* (Indonesian: *rotan irit*. *Calamus trachycoleus*)—either directly in the swidden together with rice or other annuals like maize or cassava used for subsistence or commercial purposes, or cultivate them in a nursery to be transplanted as seedlings in the subsequent year.<sup>5</sup> Farmers might also collect seedlings from productive rattan gardens and transplant them into their swiddens after harvest. The rattan plants are left to grow during the fallow period with the secondary vegetation to develop into a rattan garden (Ngaju Dayak: *kabon uei/uwei*), which can be harvested for the first time approximately 7–10 years after planting. Depending on the species, rattan can be harvested successively over a span of 30–50 years (Belcher et al 2005 p. 247), with large harvests possible every 2–3 years and small harvests whenever there is need to obtain some immediate cash, as was reported by rattan smallholders in Katingan.<sup>6</sup>

<sup>4</sup> It has been suggested that rattan gardens first emerged in the areas around the Barito, Kapuas and Kahayan rivers in Central Kalimantan and gradually dispersed to other regions in Central, South and East Kalimantan (van Tuil 1929 cited in Pambudhi et al 2004 p. 349).

<sup>5</sup> Other species cultivated in the rattan–swidden system are *Daemonorops crinita*, *Calamus pinisilatus*, *Calamus ornatus*, *Calamus scipionum* and *Calamus manan* (cf. also Gönner 2001, Belcher et al 2004, Pambudhi et al 2004, Sumardjani 2011).

<sup>6</sup> If the species have clusters of stems, the rattan clump develops between 40–60 stems over the following decades. Some rattans, such as *uei marau* (Indonesia: *rotan manau*; *Calamus manan*), have solitary stems.

## 4. Katingan: geographical and ethnographic overview

Named after the Katingan River, which curls 650 km from the Schwaner Mountain Range in Borneo's interior to the Java Sea, Katingan district is located at the heart of Central Kalimantan province (Figure 3). With an area of 153 564 km<sup>2</sup>, Central Kalimantan is the third largest province after Papua and East Kalimantan. Given this expanse, the province is sparsely populated. According to the 2010 census, only about 2.2 million people live in Central Kalimantan, with a population density of 14 persons/km<sup>2</sup> (BPS 2010). A large share of the province's inhabitants is found in the provincial capital of Palangka Raya and larger towns. The remaining residents live in small settlements widely dispersed along a network of rivers and streams through dense lowland rainforests of mangroves, freshwater swamps, peat swamps and dry *Dipterocarp* forests and agriculture land.

The majority of Central Kalimantan's population are Ngaju Dayak, who are the most numerous and dominant Dayak group within Southeast Borneo (Knapen 2001 p. 89). Ot Danum and different Muslim groups—including Malay, Buginese, Banjarese, Javanese and Madurese—are also part of the provincial population (cf. Casson 2001 p. 1). *Ngaju* means 'upstream' and traditionally refers to swidden cultivators living along the middle and lower reaches of the province's waterways, including the Katingan (Baier 1977 p. 3, Schiller 1997 p. 14–16).

With 17 800 km<sup>2</sup>, Katingan district is the second largest district in Central Kalimantan. It was established at the end of Indonesia's decentralisation (1999) in 2002. The latest government figures count 150 642 (2011) inhabitants of Katingan, with an average population density of 8 persons/km<sup>2</sup> (BPS 2012). Some of Katingan's inhabitants live in the district capital Kasongan and in Tumbang Samba further upstream. However, the majority of the district population resides in small hamlets of a few hundred people along the Katingan River and its countless creeks. Industrial development is limited, even though wage labour in the palm oil industry increasingly represents an alternative income source. The majority of Katingan's population, including people in Tumbang Runen and Tumbang Malawan, continue to rely heavily on natural resources to sustain their livelihoods, that is, fishing, swidden agriculture, (artisanal) gold mining and rattan production.

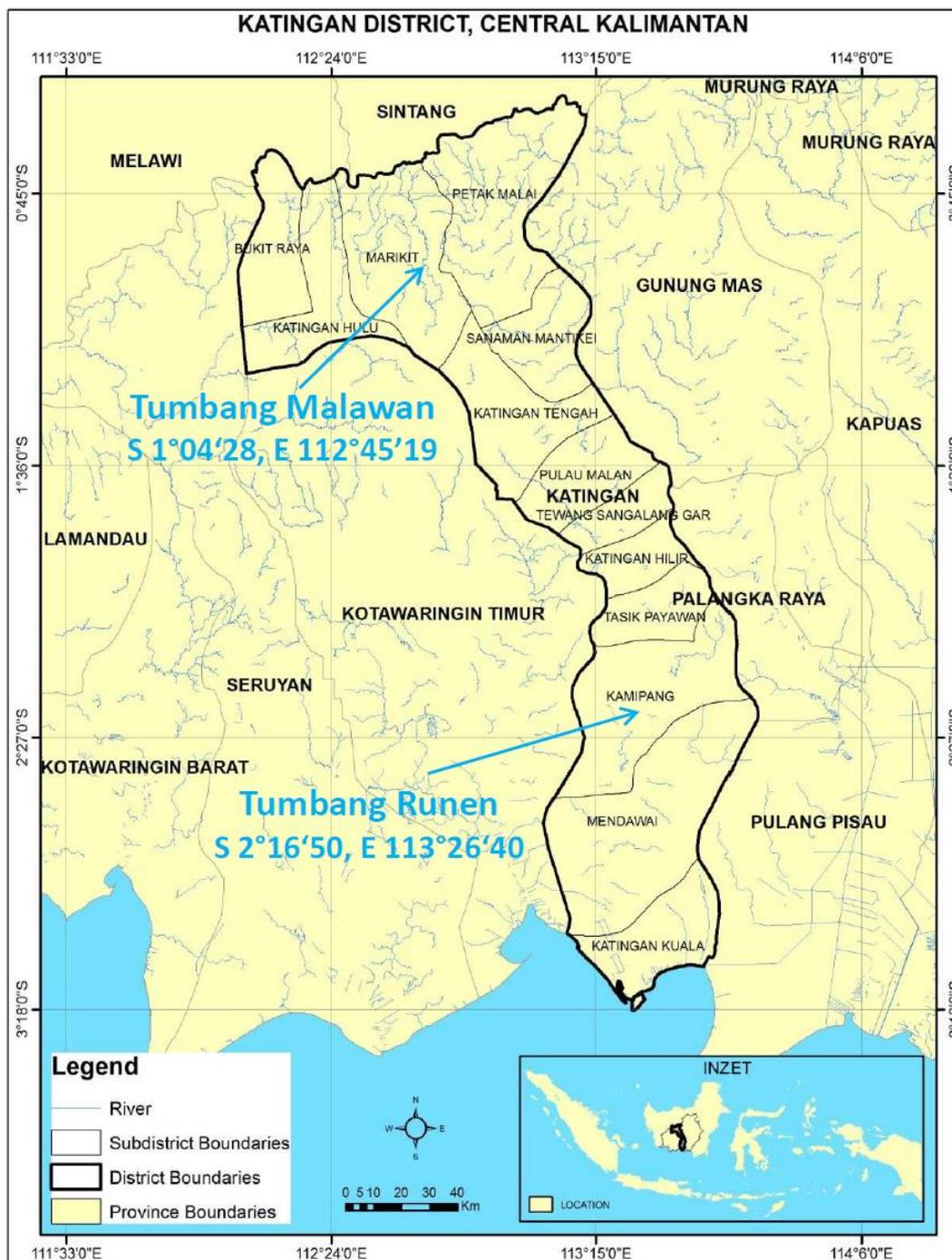


Figure 3. Map of Katingan district

#### 4.1 Tumbang Runen

Surrounded by secondary swamp and peat-swamp forest, Tumbang Runen (S 2°16'50, E 113°26'40) is located in the lowlands of Katingan in Kamipang sub-district. Kamipang is Katingan's largest sub-district (2793 km<sup>2</sup>), with a sparse population density of 2.3 persons/km<sup>2</sup>. Tumbang Runen counts 74 households with a total population of 370 (October 2012), almost all of whom are Muslim. Since 2011, a road connects the village to the district capital of Kasongan and, since January 2013, there is electricity at night.

Elders of Tumbang Runen remember a time when people mainly lived from swidden agriculture, fishing, rattan harvesting and the collection of tree bark. Like most Dayak groups, they used the organic soils or very shallow peat areas close to the river banks for cultivating dry rice, vegetables and rattan. However, with the arrival of logging concessions (Hak Penguasaan Hutan/HPH) in the area in the 1970s, patterns of livelihoods slowly began to alter. During the 1970s and 1980s, people were still busily engaged in the harvesting and processing of rattan. Villagers followed the logging railways into the forest to extract tree bark. However, with the government ban on exports of rattan raw material in 1986 and on semi-finished rattan products in 1988, rattan became less lucrative and villagers started to increasingly engage in logging. Sponsored by middlemen, people dug channels into the surrounding forest in order to extract valuable timber species—such as ramin (*Gonystylus* sp), meranti (*Shorea* sp) and martibu (*Eugenia* sp)—during times of favourable water table, known as flood logging (*tebang banjir*). With the logging operations, however, the peat swamp lost its ecological function, becoming prone to fires during the dry season and floods during the rainy season. Until the logging was finally ended in 2006, it was the major income source for villagers of Tumbang Runen. Fishing, rattan harvesting and minor agricultural activities functioned as supplements.

Nowadays, people mainly make a living from fishing, wage labour in a recently established palm-oil plantation in the village territory and occasionally from harvesting *rattan irit* and *rattan sigi*. Fourteen ‘wild’ rattan species grow in the area, some of which once were of economic value. Besides benefitting from rattan as a source of cash income, people in Tumbang Runen continue to use rattan mainly for weaving baskets, making fishing tools, as food and as tying material, albeit on a lesser scale than in the past.

## 4.2 Tumbang Malawan

Tumbang Malawan (S 1°04'28, E 112°45'19) is located in Marikit sub-district on an upland tributary of the Katingan River. With 2178 km<sup>2</sup>, Marikit is Katingan’s second-largest sub-district, covered by primary and secondary lowland rainforest, agroforests and swidden plots. Like Kamipang, Marikit has a low population density: 3.1 persons/km<sup>2</sup> (BPS 2012). The village has 54 households for a population of 237, almost all of whom follow the Kaharingan religion. In the official discourse, Tumbang Malawan would probably be classified as a ‘left behind and isolated village’ given its rather remote location and poor infrastructure. A road connecting to the sub-district capital and a middle school (Sekolah Menengah Pertama/SMP) have just recently been established. Drinking water is drawn from the river despite the extensive gold mining activities upriver. Electricity is only available to those who can afford a generator.

Based on what Dove (2011 p. 13–17) has called a ‘dual or composite economy’ of swidden agriculture coupled with rattan as source of cash income, subsistence livelihoods remain widespread. However, while the harvesting and processing of rattan were lucrative during the 1970s and 1980s, today cash is obtained mainly from gold mining. The latter became popular after logging ended in 2006. Yet, compared to Tumbang Runen, in Tumbang Malawan logging experienced a much shorter boom, from 2001 to 2006. And while in lowland Tumbang Runen people’s logging activities were primarily determined by the watertable of the forest, in Tumbang Malawan the villagers adjusted their logging operations to the swidden calendar, which even during the time of logging retained its importance.

For a long time, swiddening has not only been the central pillar of the household economy for people in Tumbang Malawan but a cultural practice, involving in line with Kaharingan belief a sequence of

rituals structuring the annual cycle. While swiddening allows households to cover their rice and vegetable needs, hunting has become the major source of protein since fish stocks have drastically decreased as a consequence of the mining upriver. Hunting is, in addition to mining, a means for villagers to obtain cash, given that their rattan gardens do not yield any profit.

Notwithstanding the present unimportance of rattan as a cash crop, rattan remains significant in everyday life in Tumbang Malawan. People use it for weaving, tool making, dyeing, as food, as a construction and tying material and in ritual contexts. A freelist exercise and discussion with villagers suggested 39 rattan species exist in the area of Tumbang Malawan. Owing to time constraints, only 31 species have been verified so far, many of which grow in people’s gardens.

## 5. Why do farmers abandon or keep their rattan gardens?

In both Tumbang Runen and Tumbang Malawan, the majority of households possess rattan gardens (Figure 4). In Tumbang Malawan, 79% of all households have a rattan garden, with 4.6 plots on average. In Tumbang Runen, 81% of all households possess 1.48 rattan plots on average.

The picture changes, especially for Tumbang Runen, when examining individual families. However, this study takes the household as the unit of analysis. In Tumbang Runen, of those households that do not possess a rattan garden, 12% never had one and 12% are interested in (re-)obtaining a rattan garden. In Tumbang Malawan, by contrast, only 9% of the ‘do not have’ households never had a rattan garden and 36% of them expressed interest in (re-)gaining one. This differing interest is also reflected in the variation of planting activities during the last three-to-four years (Figure 5).

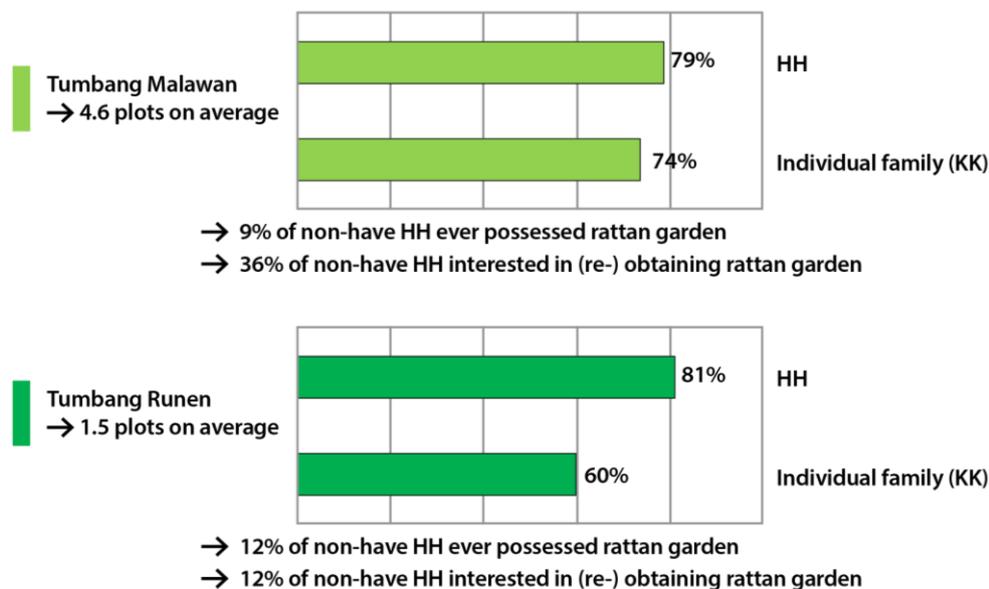


Figure 4. Ownership of rattan gardens

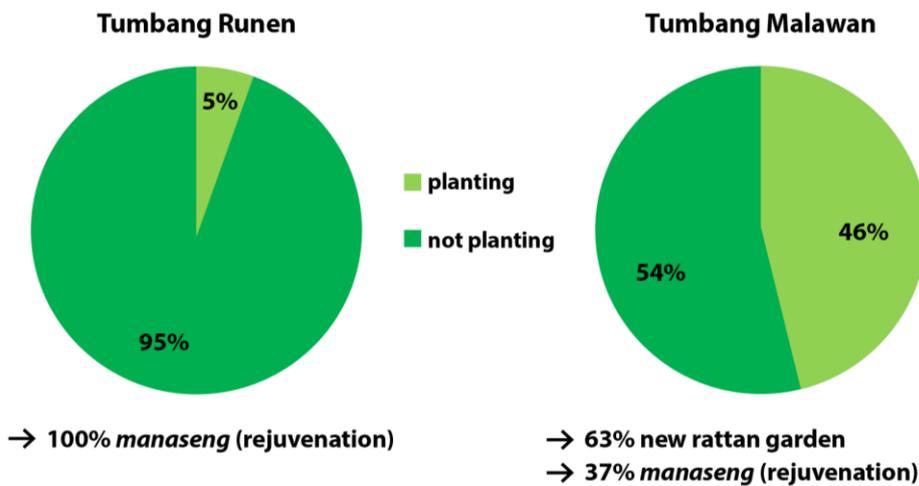


Figure 5. Planting activities in the last three-to-four years

In Tumbang Runen, only 5% of all households planted rattan in the last three-to-four years. These farmers did not establish new rattan gardens but rejuvenated plots by transplanting seedlings, a practice called *manaseng* in Ngaju Dayak. In the upland village of Tumbang Malawan, people had been much more active in planting: 46% of all households had planted rattan in the last three-to-four years; of which 63% established new gardens following their rice harvest; and 37% of all households rejuvenated old ones. If we also take into account planting activities in, and before, 2009, it seems clear that people in Tumbang Malawan are more active in managing rattan than people in Tumbang Runen, where 75% of all households have never (trans-) planted rattan (Figure 6).

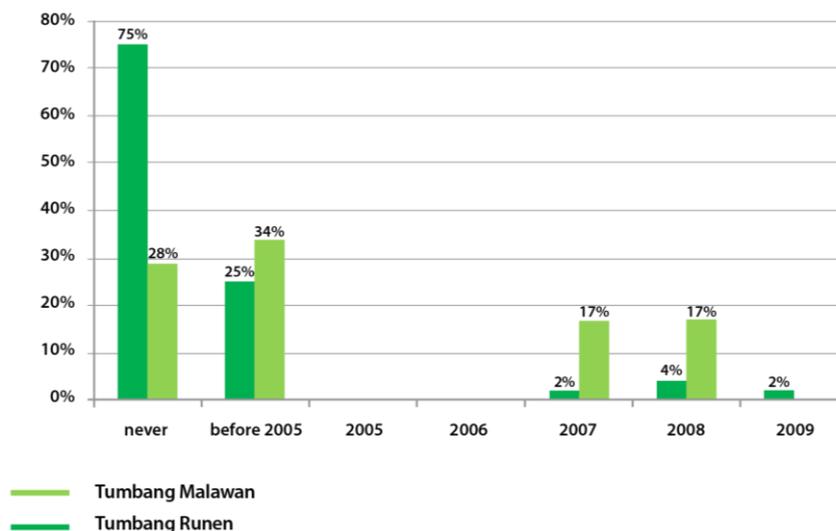


Figure 6. Planting activities in 2009 and earlier

Taking into consideration the sale and conversion of rattan gardens to other land-uses, the picture, however, becomes more complicated. As Figure 7 shows, hardly any households in Tumbang Runen ever sold or converted a rattan garden. In upland Tumbang Malawan, by contrast, 46% of all households reported that they had previously sold or converted a rattan garden, with the majority replacing rattan with rubber (74%); 42% selling their rattan garden; and 26% turning them into gold mines (Figure 8). Either people mine by themselves in their garden or they allow others to mine there, receiving a 10% share of any profits or an initial payment as compensation.

How can these contrasting pictures be explained? On the one hand, a high rate of sale and conversion of rattan gardens paired with more active planting activities and considerable interest in (re-)obtaining a rattan garden; and, on the other, a low rate of sale and conversion of rattan gardens together with a low rate of planting activities and general lack of interest in (re-)gaining a new rattan garden?

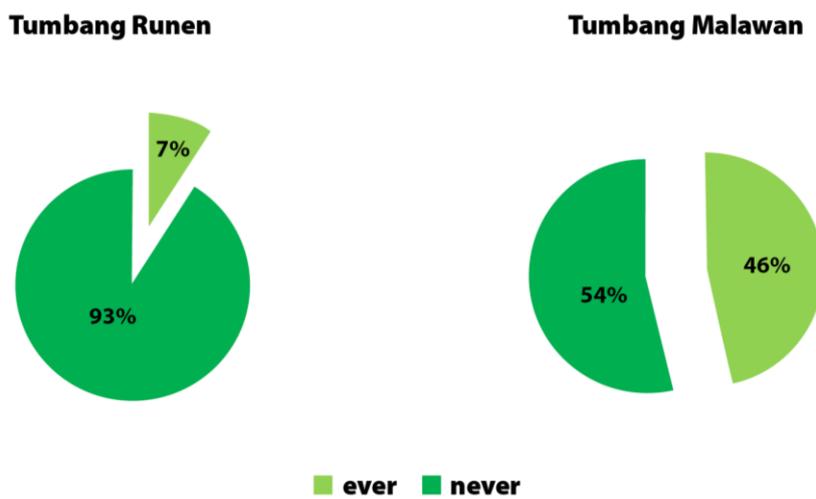


Figure 7. Sale and land-use change

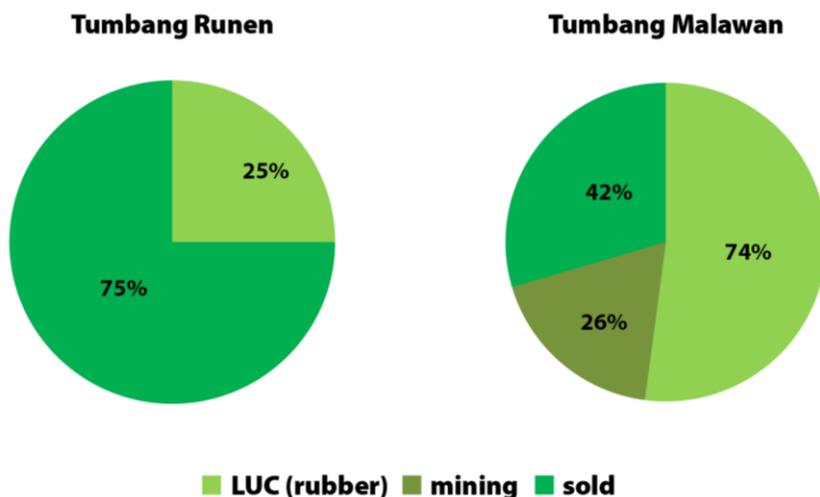


Figure 8. Sale and land-use change according to purpose

## 5.1 Reasons for not harvesting

People in both Tumbang Malawan and Tumbang Runen frequently reported that they had become lazy to harvest rattan because *jatun rega*, literally, ‘there is no price’, which, in the case of upland Tumbang Malawan, can also mean an absence of a buyer.

Both of these were given as primary reasons why the people of Tumbang Malawan were not harvesting in 2012 but it must be noted that they were also busy with mining, allowing them to obtain cash income (Figure 9).

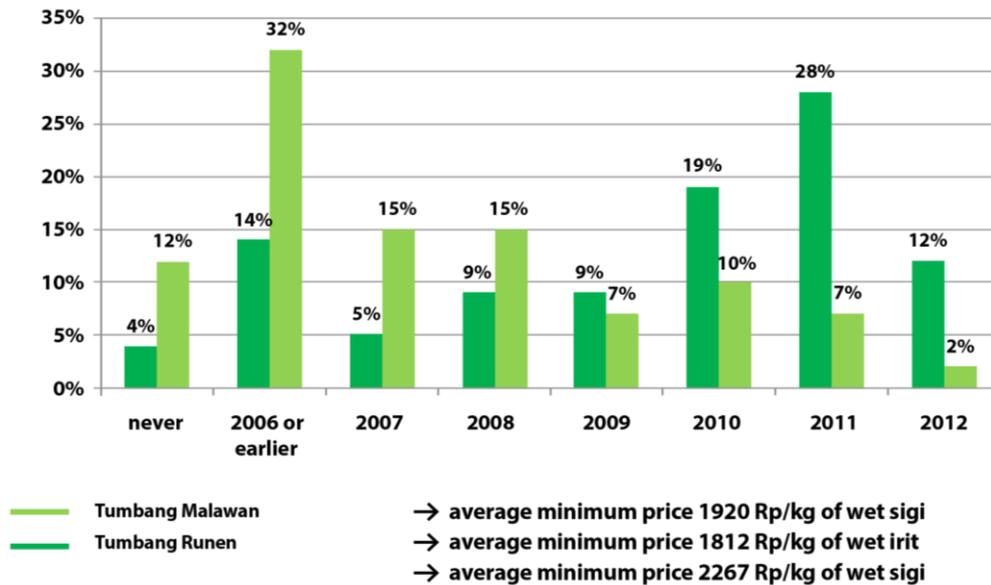
In Tumbang Runen, a combination of a low rattan price, availability of alternative livelihoods, as well as a labour shortage, explains the low harvesting activities in 2012. Villagers engaged in fishing and wage labour in the adjacent palm oil plantation, the latter making it difficult to find other people to sharecrop their gardens.



**Figure 9.** Reasons for not harvesting

Thus, in 2012, only one household in Tumbang Malawan harvested rattan, based on the rumour that a trader would come to the village to buy rattan. Since it was indeed only a rumour, the farmer was not able to sell their rattan.

In Tumbang Runen, with a rattan trader in the village, 12% of all households harvested in 2012, mainly because of economic needs (Figure 10). The relatively active harvesting in the village one year before is explained by the absence of palm-oil wage labour as an alternative and a relatively high rattan price owing to the export of unfinished and semi-finished rattan not yet being banned. In 2011, the farm gate price for 1kg of wet (unprocessed) *irit* reached IDR1800, whereas 1kg of wet *sigi* cost IDR2000, corresponding to the present average minimum price expected by people in Tumbang Runen.



**Figure 10.** Harvesting activities

As mentioned above, people in lowland Tumbang Runen usually sell their rattan to a fellow villager. Although people commonly receive a lower price, if they harvest on the basis of credit—usually IDR5000–10000 per 100kg of wet rattan—they are protected from unrestrained profit-takers because the middleman is kin, unlike the situation experienced by the villagers of Tumbang Malawan. The latter sell their rattan to outside traders who are seeking profit at the expense of the villagers, whose bargaining power is weak vis-à-vis these downstream traders. First, farmers receive a lower price owing to the relatively remote location of the village. Moreover, price drops of 50% of the initial offered price or even non-collection of the rattan have been frequently experienced. Rattan harvesting, thus, is a risky undertaking not only economically but also when the phenomenological experience of harvesting is taken into consideration (Figure 11). The analysis of qualitative statements by rattan harvesters clearly shows that harvesting rattan is, foremost, ‘painful’. A 52-year-old farmer explained:

Rattan harvesting is the hardest work on Earth. First, the spines; second, you have to pull hard; third, you have to climb; fourth, you have to peel the skin off; fifth, you have to carry the rattan to the river; sixth, you have to bundle the rattan; seventh, you have to release it into the water and then lift it again; and eighth, there are many mosquitoes and other insects. In fact, harvesting rattan just makes trouble.

Interview with a rattan farmer; 17.10.2012



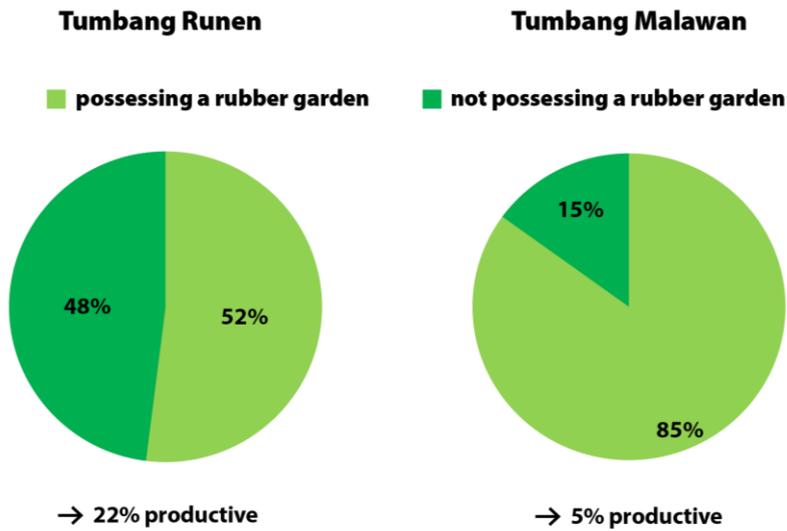


Figure 12. Ownership of rubber gardens

In Tumbang Malawan, 85% of all households possess a rubber garden, yet so far only 5% of these households have already tapped rubber. Rubber is a recent trend in Tumbang Malawan, confirmed by both what people have planted in their swidden following this year's harvest and what they intend to plant in their fallow swiddens or empty land. In 2013, 85% of those households planting cash crops following the rice harvest planted rubber (Figure 13). Ninety-five percent (95%) of those households intending to plant something in their fallow swiddens and empty land said that rubber was their priority. These plans trace back not only to the fact that the village has recently been the focus of a rehabilitation project by the forestry office, providing them with rubber seedlings, but also needs to be understood against psychological factors. By planting rubber people adhere to the principle of *umba rayan uluh*, literally, to 'follow the season of people': they don't want to be excluded from a hopefully prosperous development.

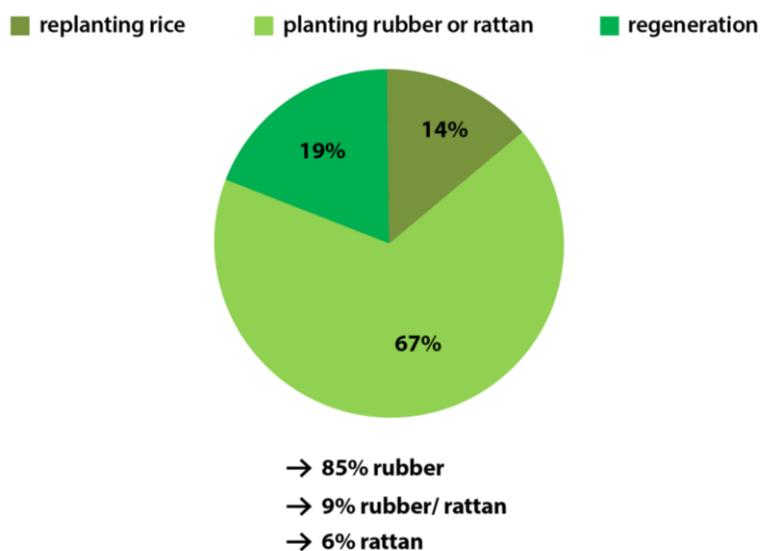


Figure 13. Planting activities in 2012/13 swidden cycle in Tumbang Malawan

### 5.3 Swiddening and engagement with land

As becomes evident, people in upland Tumbang Malawan are active swidden farmers. Figure 14 shows that 92% of all households had established a swidden during the last three years and 79% of all households could cover their rice needs on a subsistence base last year (2012/13). Soil fertility and distance to the village are decisive factors in field selection. Rattan gardens, located on the flat, fertile areas along the river—locally called *datah*—which are easier accessed by motorized canoes, are preferred for swiddening, usually followed by planting rattan or, lately, rubber. Planting and replanting are the customary ways of engaging with the land for people in Tumbang Malawan. Also, replacing rattan with rubber does not necessarily lead to complete abandonment of rattan gardens, given the average amount of 4.6 rattan plots per household. Rather, establishing a rubber garden is a way of diversifying a household’s economy.

In the lowland village of Tumbang Runen, by contrast, only 10% of all households tried to establish a rice swidden during the last three-to-four years. They all failed because of flooding. The majority of households have never established a rice swidden (61%). Rather, ‘people have been practising swiddening on trading vessels for decades’, as reported by an elder of Tumbang Runen, meaning that rice had long been bought from Banjarese traders. Nowadays, only a few households plant cassava, maize and vegetables on small plots. Agricultural activities are thus limited, not least owing to poor soils in an environment of mainly peatland and unpredictable floods that regularly destroy harvests.

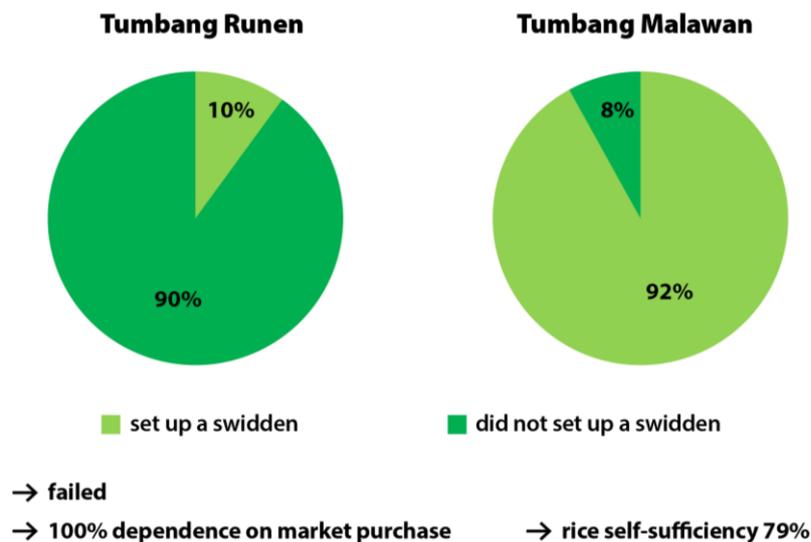


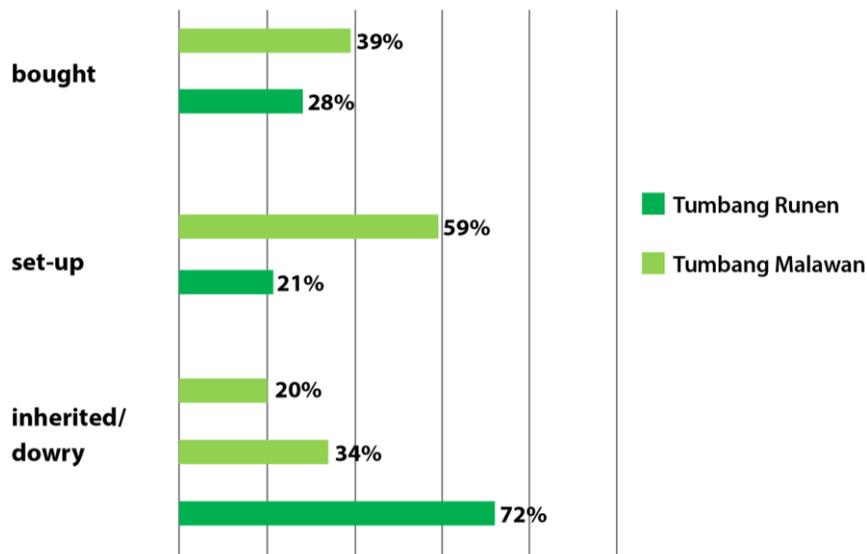
Figure 14. Rice swiddening in the last three years

### 5.4 Ways of obtaining rattan gardens

This variation in agricultural practice and engagement with land is also evident if we consider the way people have obtained their rattan gardens (Figure 15).

In lowland Tumbang Runen, most rattan gardens have been inherited. In Tumbang Malawan, by contrast, gardens have mainly been established by people independently, with only some gardens having been inherited or obtained as dowry.

In Tumbang Runen, 37% of all households possess inherited rattan gardens that are owned on a family basis, that is, gardens have not been divided amongst the children but were received, and now managed, as collective property. This phenomenon is absent in upland Tumbang Malawan, where, in line with cognatic kinship, rattan gardens are usually divided on an equal basis amongst male and female children.<sup>8</sup> Whereas individual ownership puts decision-making at the level of the individual family, collective ownership constrains conversion of rattan gardens insofar as common agreement needs to be reached.



**Figure 15.** Ways of acquiring rattan gardens

The inheritance of gardens from parents, however, is of deeper, emotional meaning, as pointed out by research into rattan cultivation in East Kalimantan (Belcher et al 2004 p. 86). In Tumbang Runen, rattan gardens are considered legacy (*warisan*), creating a sense of belonging, connecting people to their ancestors. Village genealogy traces back to a common late-19<sup>th</sup> century ancestor who, according to ethno-history, owned the majority of rattan gardens in the lower Katingan and became rich through trading rattan as far as Singapore. Some rattan gardens have been handed down from generation to generation since that time. For the people of Tumbang Runen, rattan gardens are part of their history, of their identity. Exploring why smallholders keep their gardens, despite the unstable rattan price and low returns during the last years, farmers emphasized the low labour input required for maintenance, their role as a safeguard in times in need (cf. Belcher et al 2004 p. 85, Pambudhi et al 2004 p. 362) and expressed hopes for a higher rattan price in the future. However, as Figure 16 clearly reveals, the psychological meaning of rattan gardens as a legacy is the main reason why the villagers of Tumbang Runen keep their gardens, irrespective of the latter's present unprofitability.

<sup>8</sup>Although in Tumbang Runen kinship is likewise recognized bilaterally, given the influence of Muslim tradition, male children frequently receive a larger share compared to their sisters.





## 6. Concluding remarks

Rattan farmers both in Tumbang Runen and Tumbang Malawan are hardly aware of Katingan's vision of becoming Indonesia's rattan district, the national government's protectionist measures of banning the export of unfinished and semi-finished rattan in order to boost the national furniture industry, or the initiatives undertaken by NGOs to support local rattan farmers. A few individuals might occasionally partake in NGO- or government-led activities, however, often they are left with hopes, not seldom with disappointment about the gap between visions and practice.

Rattan smallholders at the two fieldsites might not envision certified 'green' rattan nor a booming local rattan industry nor orderly and 'proper' rattan plantations. However, the studies of Tumbang Runen and Tumbang Malawan have shown that rattan farmers in Katingan do have visions and hopes concerning the future of their rattan gardens. At least at the time of writing, smallholders in Tumbang Runen and Tumbang Malawan not only still consider rattan gardens as an integral part of their present livelihoods' portfolio (notwithstanding the low returns) but also envision rattan gardens as being part of their children's future: as safeguard in times of hardship; as potentially lucrative income source in case of a rising rattan price; as dowry; or as a legacy from the ancestors. In their basic essence, namely the continued existence of rattan gardens, these visions do not differ from the ones projected by the government and NGOs.

Overcoming weak coordination, poor cooperation and competition through common coherent action in the present are preconditions for turning the common vision into practice. Moreover, listening to the multiple voices of rattan farmers and taking into account what future they envision for their gardens gives some insight into why smallholders in Indonesia's self-proclaimed 'rattan district' abandon or keep their gardens and, thus, helps us to understand the complex world in which rattan farmers find themselves at present.

## References

- Arifin YF. 2003. *Traditionelle Rattangärten in Zentralkalimantan, Indonesien*. Traditional rattan gardens of Central Kalimantan. Göttingen, Germany: Cuvillier Verlag.
- Asbjørnsen H, Angelsen A, Belcher B, Michon G, Ruiz-Perez M, eds. 2000. *Proceedings of the workshop cultivating in tropical forests? The evolution and sustainability of systems of management between extractivism and plantations*. Workshop 28 June–1 July 2000, Kraemmerivika, Lofoten, Norway. Wageningen, Netherlands: European Tropical Forest Research Network.
- [BPS] Badan Pusat Statistik. 2010. *Katingan in figures 2010*. Katingan: Badan Pusat Statistik.
- [BPS] Badan Pusat Statistik (BPS) 2012. *Katingan in figures 2012*. Katingan: Badan Pusat Statistik.
- Baier M. 1977. *Das Adatbußrecht der Ngaju-Dayak. Text, Übersetzung und Erklärung der Adatbußrechtssammlung von Johannes Saililah (Saililah-Kodex)*. The customary law of the Ngaju Dayak: Text, translation and explanations of the collection of adat by Johannes Saililah (Saililahcodex). Dissertation zur Erlangung des Akademischen Grades, Doktor der Philosophie des Fachbereichs Altertumsund Kulturwissenschaften der Eberhard-Karls-Universität Tübingen. Tübingen, Germany: Mauthe KG.
- Belcher B. 2001. Rattan cultivation and livelihoods: the changing scenario in Kalimantan. *Unasylva* 205.
- Belcher B, Imang N, Achdiawan R. 2004. Rattan, rubber, or palm oil: cultural and financial considerations for farmers in Kalimantan. *Economic Botany* 58:77–87.
- Belcher B, Michon G, Angelsen A, Ruiz Pérez M, Asbjørnsen H. 2005. The socioeconomic conditions determining the development, persistence, and decline of forest garden systems. *Economic Botany* 59(3):245–253.
- Casson A. 2001. *Decentralisation of policies affecting forests and estate crops in Kotawaringin Timur District, Central Kalimantan*. Bogor, Indonesia: Center for International Forestry Research.
- Dove MR. 2011. *The banana tree at the gate. A history of marginal peoples and global markets in Borneo*. London: Yale University Press.
- Dransfield J. 1992a. *The rattans of Sarawak*. Kew, UK: Royal Botanic Gardens; Kuching, Malaysia: Sarawak Forest Department.
- Dransfield J. 1992b. Rattans in Borneo: botany and utilisation. In: Ghazally I, Murtedza M, Siraj O, eds. *Proceedings of the International Conference on Forest Biology and Conservation in Borneo*. 30 July–3 August 1990, Kota Kinabalu, Sabah, Malaysia. Kota Kinabalu, Malaysia: Yayasan Sabah. p. 22–31.
- Dransfield J. 2002. General introduction to rattan: the biological background to exploitation and the history of rattan research. In: Dransfield J, ed. *Rattan: current research issues and prospects for conservation and sustainable development*. Rome: Food and Agriculture Organization of the United Nations.
- Dransfield J, Manokaran N, eds. 1994. *Rattans*. Plant Resources of Southeast Asia no. 6. Bogor, Indonesia: Plant Resources of Southeast Asia.
- Dransfield J, Uhl NW, Asmussen CB, Baker WJ, Harley MM, Lewis CE. 2008. *Genera Palmarum. The evolution and classification of palms*. Kew, UK: Royal Botanical Gardens, Kew Publishing.
- Fried SG. 2000. Tropical forests forever? A contextual ecology of Benthian agroforestry systems. In: Zerner C, ed. *People, plants, & justice. The politics of nature conservation*. New York: Columbia University Press. p. 204–233.
- Fried ST, Mustofa AS. 1992. Social and economic aspects of rattan production, middle Mahakam region: a preliminary survey. *GFG Report* 21:6372.
- Godoy RA. 1990. The economics of traditional rattan cultivation. *Agroforestry Systems* 12:163–172.

- Godoy RA, Feaw TC. 1991. Agricultural diversification among smallholder rattan cultivators in Central Kalimantan, Indonesia. *Agroforestry Systems* 13:27–40.
- Gönner C. 2001. *Muster und Strategien der Ressourcennutzung: Eine Fallstudie aus einem Dayak Benuaq Dorf in Ost-Kalimantan, Indonesien*. A forest tribe of Borneo: resource use among the Dayak Benuaq. Forstwissenschaftliche Beiträge der Professur Forstpolitik und Forstökonomie. Zürich, Switzerland: Eidgenössische Technische Hochschule Zürich.
- Knapen JJ. 2001. *Forests of fortune? The environmental history of Southeast Borneo 1600–1880*. Leiden, Netherlands: KITLV Press.
- Matius P. 2004. *Plant diversity and utilization of rattan gardens*. Freiburger Forstliche Forschung Band 28. Freiburg, Germany: Waldbau Institut.
- McCay BJ. 2009. An intellectual history of ecological anthropology. In: Walters BB, McCay BJ, West P, Lees S, eds. *Against the grain: the Vayda tradition in human ecology and ecological anthropology*. Lanham, USA: AltaMira. p. 11–26.
- Mayer J. 1989. Rattan cultivation, family economy and land use: a case from Pasir, East Kalimantan. *German Forestry Group Report* 13:39–53.
- Pambudhi FP, Belcher B, Levang P, Dewi S. 2004. Rattan (*Calamus* spp) gardens of Kalimantan: resilience and evolution in a managed non-timber forest product system. In: Kusters K, Belcher B, eds. *Forest products, livelihoods and conservation: case studies of non-timber forest product systems*. Bogor, Indonesia: Center for International Forestry Research. p. 347–365.
- Rawing D. 2007. Local government policies in the rattan development of Katingan Regency. In: International Tropical Timber Organization, Ministry of Forestry, eds. *Rattan in Indonesia*. Jakarta: International Tropical Timber Organization, Ministry of Forestry. p. 60–66.
- Sasaki H. 2007. Innovations in swidden-based rattan cultivation by Benuaq farmers in East Kalimantan, Indonesia. In: Cairns M, ed. *Voices from the forest: integrating indigenous knowledge into sustainable upland farming*. Washington, DC: RFF Book. p. 459–470.
- Schiller AL. 1997. *Small sacrifices. Religious change and cultural identity among the Ngaju of Indonesia*. New York: Oxford University Press.
- Siebert SF. 2012. *The nature and culture of rattan. Reflections on vanishing life in the forests of Southeast Asia*. Honolulu: University of Hawai'i Press.
- Sunderland TCH, Dransfield J. 2002. Species Profiles. In: Dransfield J, ed. *Rattan: current research issues and prospects for conservation and sustainable development*. Rome: Food and Agriculture Organization of the United Nations.
- Sumardjani L. 2011. *Studi Rotan di Katingan, Kalimantan Tengah*. Rotan study in Katingan, Central Kalimantan. nl: Yayasan Rotan Indonesia.
- Van Noordwijk M, Agus F, Dewi S, Ekadinata A, Tata HL, Suyanto, Galudra G, Pradhan UP. 2010. *Opportunities for reducing emissions from all land uses in Indonesia: policy analysis and case studies*. Nairobi: ASB Partnership for the Tropical Margins.
- Van Tuil JH. 1929. Handel en cultuur van rotan in de zuiderenooster afdeeling van Borneo. Trade and culture of rattan in the southeastern section of Borneo. *Tectona* 22:695–717.
- Van Valkenburg JLCH. 2002. Rattan in East Kalimantan, Indonesia. Species composition, abundance, distribution and growth in some selected sites. In: Dransfield J, ed. *Rattan: current research issues and prospects for conservation and sustainable development*. Rome: Food and Agriculture Organization of the United Nations.
- Vayda AP. 2009. *Explaining human actions and environmental changes*. Lanham, USA: AltaMira Press.
- Vayda AP, Walters BB, eds. 2011. *Causal explanation for social scientists: a reader*. Lanham, USA: AltaMira Press.
- Weinstock JA. 1983. Rattan: ecological balance in a Borneo rainforest swidden. *Economic Botany* 37(1):58–68.

- Xu J. 2007. Rattan and tea-based intensification of shifting cultivation by Hani Farmers in Southwestern China. In: Cairns M, ed. *Voices from the forest: integrating indigenous knowledge into sustainable upland farming*. Washington, DC: RFF Bookp. 665–672.
- Xu J, Lebel L, Sturgeon J. 2009. Functional links between biodiversity, livelihoods, and culture in a Hani swidden landscape in Southwest China. *Ecology and Society* 14(2):20.



## WORKING PAPERS IN THIS SERIES

### 2005

1. Agroforestry in the drylands of eastern Africa: a call to action
2. Biodiversity conservation through agroforestry: managing tree species diversity within a network of community-based, nongovernmental, governmental and research organizations in western Kenya.
3. Invasion of *prosopis juliflora* and local livelihoods: Case study from the Lake Baringo area of Kenya
4. Leadership for change in farmers organizations: Training report: Ridar Hotel, Kampala, 29th March to 2nd April 2005.
5. Domestication des espèces agroforestières au Sahel : situation actuelle et perspectives
6. Relevé des données de biodiversité ligneuse: Manuel du projet biodiversité des parcs agroforestiers au Sahel
7. Improved land management in the Lake Victoria Basin: TransVic Project's draft report.
8. Livelihood capital, strategies and outcomes in the Taita hills of Kenya
9. Les espèces ligneuses et leurs usages: Les préférences des paysans dans le Cercle de Ségou, au Mali
10. La biodiversité des espèces ligneuses: Diversité arborée et unités de gestion du terroir dans le Cercle de Ségou, au Mali

### 2006

11. Bird diversity and land use on the slopes of Mt. Kilimanjaro and the adjacent plains, Tanzania
12. Water, women and local social organization in the Western Kenya Highlands
13. Highlights of ongoing research of the World Agroforestry Centre in Indonesia
14. Prospects of adoption of tree-based systems in a rural landscape and its likely impacts on carbon stocks and farmers' welfare: The FALLOW Model Application in Muara Sungkai, Lampung, Sumatra, in a 'Clean Development Mechanism' context
15. Equipping integrated natural resource managers for healthy Agroforestry landscapes.
17. Agro-biodiversity and CGIAR tree and forest science: approaches and examples from Sumatra.
18. Improving land management in eastern and southern Africa: A review of policies.
19. Farm and household economic study of Kecamatan Nanggung, Kabupaten Bogor, Indonesia: A socio-economic base line study of Agroforestry innovations and livelihood enhancement.
20. Lessons from eastern Africa's unsustainable charcoal business.
21. Evolution of RELMA's approaches to land management: Lessons from two decades of research and development in eastern and southern Africa
22. Participatory watershed management: Lessons from RELMA's work with farmers in eastern Africa.
23. Strengthening farmers' organizations: The experience of RELMA and ULAMP.
24. Promoting rainwater harvesting in eastern and southern Africa.
25. The role of livestock in integrated land management.
26. Status of carbon sequestration projects in Africa: Potential benefits and challenges to scaling up.
27. Social and Environmental Trade-Offs in Tree Species Selection: A Methodology for Identifying Niche Incompatibilities in Agroforestry [*Appears as AHI Working Paper no. 9*]
28. Managing tradeoffs in agroforestry: From conflict to collaboration in natural resource management. [*Appears as AHI Working Paper no. 10*]

29. Essai d'analyse de la prise en compte des systemes agroforestiers pa les legislations forestieres au Sahel: Cas du Burkina Faso, du Mali, du Niger et du Senegal.
30. Etat de la recherche agroforestière au Rwanda etude bibliographique, période 1987-2003

## 2007

31. Science and technological innovations for improving soil fertility and management in Africa: A report for NEPAD's Science and Technology Forum.
32. Compensation and rewards for environmental services.
33. Latin American regional workshop report compensation.
34. Asia regional workshop on compensation ecosystem services.
35. Report of African regional workshop on compensation ecosystem services.
36. Exploring the inter-linkages among and between compensation and rewards for ecosystem services CRES and human well-being
37. Criteria and indicators for environmental service compensation and reward mechanisms: realistic, voluntary, conditional and pro-poor
38. The conditions for effective mechanisms of compensation and rewards for environmental services.
39. Organization and governance for fostering Pro-Poor Compensation for Environmental Services.
40. How important are different types of compensation and reward mechanisms shaping poverty and ecosystem services across Africa, Asia & Latin America over the Next two decades?
41. Risk mitigation in contract farming: The case of poultry, cotton, woodfuel and cereals in East Africa.
42. The RELMA savings and credit experiences: Sowing the seed of sustainability
43. Yatich J., Policy and institutional context for NRM in Kenya: Challenges and opportunities for Landcare.
44. Nina-Nina Adoung Nasional di So! Field test of rapid land tenure assessment (RATA) in the Batang Toru Watershed, North Sumatera.
45. Is Hutan Tanaman Rakyat a new paradigm in community based tree planting in Indonesia?
46. Socio-Economic aspects of brackish water aquaculture (*Tambak*) production in Nanggroe Aceh Darrusalam.
47. Farmer livelihoods in the humid forest and moist savannah zones of Cameroon.
48. Domestication, genre et vulnérabilité : Participation des femmes, des Jeunes et des catégories les plus pauvres à la domestication des arbres agroforestiers au Cameroun.
49. Land tenure and management in the districts around Mt Elgon: An assessment presented to the Mt Elgon ecosystem conservation programme.
50. The production and marketing of leaf meal from fodder shrubs in Tanga, Tanzania: A pro-poor enterprise for improving livestock productivity.
51. Buyers Perspective on Environmental Services (ES) and Commoditization as an approach to liberate ES markets in the Philippines.
52. Towards Towards community-driven conservation in southwest China: Reconciling state and local perceptions.
53. Biofuels in China: An Analysis of the Opportunities and Challenges of *Jatropha curcas* in Southwest China.
54. *Jatropha curcas* biodiesel production in Kenya: Economics and potential value chain development for smallholder farmers
55. Livelihoods and Forest Resources in Aceh and Nias for a Sustainable Forest Resource Management and Economic Progress

56. Agroforestry on the interface of Orangutan Conservation and Sustainable Livelihoods in Batang Toru, North Sumatra.
57. Assessing Hydrological Situation of Kapuas Hulu Basin, Kapuas Hulu Regency, West Kalimantan.
58. Assessing the Hydrological Situation of Talau Watershed, Belu Regency, East Nusa Tenggara.
59. Kajian Kondisi Hidrologis DAS Talau, Kabupaten Belu, Nusa Tenggara Timur.
60. Kajian Kondisi Hidrologis DAS Kapuas Hulu, Kabupaten Kapuas Hulu, Kalimantan Barat.
61. Lessons learned from community capacity building activities to support agroforest as sustainable economic alternatives in Batang Toru orang utan habitat conservation program (Martini, Endri et al.)
62. Mainstreaming Climate Change in the Philippines.
63. A Conjoint Analysis of Farmer Preferences for Community Forestry Contracts in the Sumber Jaya Watershed, Indonesia.
64. The highlands: a shared water tower in a changing climate and changing Asia
65. Eco-Certification: Can It Deliver Conservation and Development in the Tropics.
66. Designing ecological and biodiversity sampling strategies. Towards mainstreaming climate change in grassland management.
67. Towards mainstreaming climate change in grassland management policies and practices on the Tibetan Plateau
68. An Assessment of the Potential for Carbon Finance in Rangelands
69. ECA Trade-offs Among Ecosystem Services in the Lake Victoria Basin.
69. The last remnants of mega biodiversity in West Java and Banten: an in-depth exploration of RaTA (Rapid Land Tenure Assessment) in Mount Halimun-Salak National Park Indonesia
70. Le business plan d'une petite entreprise rurale de production et de commercialisation des plants des arbres locaux. Cas de quatre pépinières rurales au Cameroun.
71. Les unités de transformation des produits forestiers non ligneux alimentaires au Cameroun. Diagnostic technique et stratégie de développement Honoré Tabuna et Ingratia Kayitavu.
72. Les exportateurs camerounais de safou (*Dacryodes edulis*) sur le marché sous régional et international. Profil, fonctionnement et stratégies de développement.
73. Impact of the Southeast Asian Network for Agroforestry Education (SEANAFE) on agroforestry education capacity.
74. Setting landscape conservation targets and promoting them through compatible land use in the Philippines.
75. Review of methods for researching multistrata systems.
76. Study on economical viability of *Jatropha curcas* L. plantations in Northern Tanzania assessing farmers' prospects via cost-benefit analysis
77. Cooperation in Agroforestry between Ministry of Forestry of Indonesia and International Center for Research in Agroforestry
78. "China's bioenergy future. an analysis through the Lens if Yunnan Province
79. Land tenure and agricultural productivity in Africa: A comparative analysis of the economics literature and recent policy strategies and reforms
80. Boundary organizations, objects and agents: linking knowledge with action in agroforestry watersheds
81. Reducing emissions from deforestation and forest degradation (REDD) in Indonesia: options and challenges for fair and efficient payment distribution mechanisms

## 2009

82. Mainstreaming climate change into agricultural education: challenges and perspectives

83. Challenging conventional mindsets and disconnects in conservation: the emerging role of eco-agriculture in Kenya's landscape mosaics
84. Lesson learned RATA garut dan bengkurat: suatu upaya membedah kebijakan pelepasan kawasan hutan dan redistribusi tanah bekas kawasan hutan
85. The emergence of forest land redistribution in Indonesia
86. Commercial opportunities for fruit in Malawi
87. Status of fruit production processing and marketing in Malawi
88. Fraud in tree science
89. Trees on farm: analysis of global extent and geographical patterns of agroforestry
90. The springs of Nyando: water, social organization and livelihoods in Western Kenya
91. Building capacity toward region-wide curriculum and teaching materials development in agroforestry education in Southeast Asia
92. Overview of biomass energy technology in rural Yunnan (Chinese – English abstract)
93. A pro-growth pathway for reducing net GHG emissions in China
94. Analysis of local livelihoods from past to present in the central Kalimantan Ex-Mega Rice Project area
95. Constraints and options to enhancing production of high quality feeds in dairy production in Kenya, Uganda and Rwanda

## **2010**

96. Agroforestry education in the Philippines: status report from the Southeast Asian Network for Agroforestry Education (SEANAFE)
97. Economic viability of *Jatropha curcas* L. plantations in Northern Tanzania- assessing farmers' prospects via cost-benefit analysis.
98. Hot spot of emission and confusion: land tenure insecurity, contested policies and competing claims in the central Kalimantan Ex-Mega Rice Project area
99. Agroforestry competences and human resources needs in the Philippines
100. CES/COS/CIS paradigms for compensation and rewards to enhance environmental Services
101. Case study approach to region-wide curriculum and teaching materials development in agroforestry education in Southeast Asia
102. Stewardship agreement to reduce emissions from deforestation and degradation (REDD): Lubuk Beringin's Hutan Desa as the first village forest in Indonesia
103. Landscape dynamics over time and space from ecological perspective
104. Komoditisasi atau koinvestasi jasa lingkungan: skema imbal jasa lingkungan program peduli sungai di DAS Way Besai, Lampung, Indonesia
105. Improving smallholders' rubber quality in Lubuk Beringin, Bungo district, Jambi province, Indonesia: an initial analysis of the financial and social benefits
106. Rapid Carbon Stock Appraisal (RACSA) in Kalahan, Nueva Vizcaya, Philippines
107. Tree domestication by ICRAF and partners in the Peruvian Amazon: lessons learned and future prospects in the domain of the Amazon Initiative eco-regional program
108. Memorias del Taller Nacional: "Iniciativas para Reducir la Deforestación en la region Andino - Amazónica", 09 de Abril del 2010. Proyecto REALU Peru
109. Percepciones sobre la Equidad y Eficiencia en la cadena de valor de REDD en Perú – Reporte de Talleres en Ucayali, San Martín y Loreto, 2009. Proyecto REALU-Perú.
110. Reducción de emisiones de todos los Usos del Suelo. Reporte del Proyecto REALU Perú Fase 1
111. Programa Alternativas a la Tumba-y-Quema (ASB) en el Perú. Informe Resumen y Síntesis de la Fase II. 2da. versión revisada
112. Estudio de las cadenas de abastecimiento de germoplasma forestal en la amazonía Boliviana

113. Biodiesel in the Amazon
114. Estudio de mercado de semillas forestales en la amazonía Colombiana
115. Estudio de las cadenas de abastecimiento de germoplasma forestal en Ecuador  
<http://dx.doi.org/10.5716/WP10340.PDF>
116. How can systems thinking, social capital and social network analysis help programs achieve impact at scale?
117. Energy policies, forests and local communities in the Ucayali Region, Peruvian Amazon
118. NTFPs as a Source of Livelihood Diversification for Local Communities in the Batang Toru Orangutan Conservation Program
119. Studi Biodiversitas: Apakah agroforestry mampu mengkonservasi keanekaragaman hayati di DAS Konto?
120. Estimasi Karbon Tersimpan di Lahan-lahan Pertanian di DAS Konto, Jawa Timur
121. Implementasi Kaji Cepat Hidrologi (RHA) di Hulu DAS Brantas, Jawa Timur.  
<http://dx.doi.org/10.5716/WP10338.PDF>
122. Kaji Cepat Hidrologi di Daerah Aliran Sungai Krueng Peusangan, NAD, Sumatra  
<http://dx.doi.org/10.5716/WP10337.PDF>
123. A Study of Rapid Hydrological Appraisal in the Krueng Peusangan Watershed, NAD, Sumatra.  
<http://dx.doi.org/10.5716/WP10339.PDF>

## 2011

124. An Assessment of farm timber value chains in Mt Kenya area, Kenya
125. A Comparative financial analysis of current land use systems and implications for the adoption of improved agroforestry in the East Usambaras, Tanzania
126. Agricultural monitoring and evaluation systems
127. Challenges and opportunities for collaborative landscape governance in the East Usambara Mountains, Tanzania
128. Transforming Knowledge to Enhance Integrated Natural Resource Management Research, Development and Advocacy in the Highlands of Eastern Africa.  
<http://dx.doi.org/10.5716/WP11084.PDF>
129. Carbon-forestry projects in the Philippines: potential and challenges The Mt Kitanglad Range forest-carbon development. <http://dx.doi.org/10.5716/WP11054.PDF>
130. Carbon forestry projects in the Philippines: potential and challenges. The Arakan Forest Corridor forest-carbon project. <http://dx.doi.org/10.5716/WP11055.PDF>
131. Carbon-forestry projects in the Philippines: potential and challenges. The Laguna Lake Development Authority's forest-carbon development project.  
<http://dx.doi.org/10.5716/WP11056.PDF>
132. Carbon-forestry projects in the Philippines: potential and challenges. The Quirino forest-carbon development project in Sierra Madre Biodiversity Corridor.  
<http://dx.doi.org/10.5716/WP11057.PDF>
133. Carbon-forestry projects in the Philippines: potential and challenges. The Ikalahan Ancestral Domain forest-carbon development. <http://dx.doi.org/10.5716/WP11058.PDF>
134. The Importance of Local Traditional Institutions in the Management of Natural Resources in the Highlands of Eastern Africa. <http://dx.doi.org/10.5716/WP11085.PDF>
135. Socio-economic assessment of irrigation pilot projects in Rwanda.  
<http://dx.doi.org/10.5716/WP11086.PDF>
136. Performance of three rambutan varieties (*Nephelium lappaceum* L.) on various nursery media.  
<http://dx.doi.org/10.5716/WP11232.PDF>

137. Climate change adaptation and social protection in agroforestry systems: enhancing adaptive capacity and minimizing risk of drought in Zambia and Honduras. <http://dx.doi.org/10.5716/WP11269.PDF>
138. Does value chain development contribute to rural poverty reduction? Evidence of asset building by smallholder coffee producers in Nicaragua. <http://dx.doi.org/10.5716/WP11271.PDF>
139. Potential for biofuel feedstock in Kenya. <http://dx.doi.org/10.5716/WP11272.PDF>
140. Impact of fertilizer trees on maize production and food security in six districts of Malawi. <http://dx.doi.org/10.5716/WP11281.PDF>

## 2012

141. Fortalecimiento de capacidades para la gestión del Santuario Nacional Pampa Hermosa: Construyendo las bases para un manejo adaptativo para el desarrollo local. Memorias del Proyecto. <http://dx.doi.org/10.5716/WP12005.PDF>
142. Understanding rural institutional strengthening: A cross-level policy and institutional framework for sustainable development in Kenya. <http://dx.doi.org/10.5716/WP12012.PDF>
143. Climate change vulnerability of agroforestry. <http://dx.doi.org/10.5716/WP16722.PDF>
144. Rapid assesment of the inner Niger delta of Mali. <http://dx.doi.org/10.5716/WP12021.PDF>
145. Designing an incentive program to reduce on-farm deforestation in the East Usambara Mountains, Tanzania. <http://dx.doi.org/10.5716/WP12048.PDF>
146. Extent of adoption of conservation agriculture and agroforestry in Africa: the case of Tanzania, Kenya, Ghana, and Zambia. <http://dx.doi.org/10.5716/WP12049.PDF>
147. Policy incentives for scaling up conservation agriculture with trees in Africa: the case of Tanzania, Kenya, Ghana and Zambia. <http://dx.doi.org/10.5716/WP12050.PDF>
148. Commoditized or co-invested environmental services? Rewards for environmental services scheme: River Care program Way Besai watershed, Lampung, Indonesia. <http://dx.doi.org/10.5716/WP12051.PDF>
149. Assessment of the headwaters of the Blue Nile in Ethiopia. <http://dx.doi.org/10.5716/WP12160.PDF>
150. Assessment of the uThukela Watershed, Kwazulu. <http://dx.doi.org/10.5716/WP12161.PDF>
151. Assessment of the Oum Zessar Watershed of Tunisia. <http://dx.doi.org/10.5716/WP12162.PDF>
152. Assessment of the Ruwenzori Mountains in Uganda. <http://dx.doi.org/10.5716/WP12163.PDF>
153. History of agroforestry research and development in Viet Nam. Analysis of research opportunities and gaps. <http://dx.doi.org/10.5716/WP12052.PDF>
154. REDD+ in Indonesia: a Historical Perspective. <http://dx.doi.org/10.5716/WP12053.PDF>
155. Agroforestry and Forestry in Sulawesi series: Livelihood strategies and land use system dynamics in South Sulawesi <http://dx.doi.org/10.5716/WP12054.PDF>
156. Agroforestry and Forestry in Sulawesi series: Livelihood strategies and land use system dynamics in Southeast Sulawesi. <http://dx.doi.org/10.5716/WP12055.PDF>
157. Agroforestry and Forestry in Sulawesi series: Profitability and land-use systems in South and Southeast Sulawesi. <http://dx.doi.org/10.5716/WP12056.PDF>
158. Agroforestry and Forestry in Sulawesi series: Gender, livelihoods and land in South and Southeast Sulawesi <http://dx.doi.org/10.5716/WP12057.PDF>
159. Agroforestry and Forestry in Sulawesi series: Agroforestry extension needs at the community level in AgFor project sites in South and Southeast Sulawesi, Indonesia. <http://dx.doi.org/10.5716/WP12058.PDF>
160. Agroforestry and Forestry in Sulawesi series: Rapid market appraisal of agricultural, plantation and forestry commodities in South and Southeast Sulawesi. <http://dx.doi.org/10.5716/WP12059.PDF>

## 2013

161. Diagnosis of farming systems in the Agroforestry for Livelihoods of Smallholder farmers in Northwestern Viet Nam project. <http://dx.doi.org/10.5716/WP13033.PDF>
162. Ecosystem vulnerability to climate change: a literature review. <http://dx.doi.org/10.5716/WP13034.PDF>
163. Local capacity for implementing payments for environmental services schemes: lessons from the RUPES project in northeastern Viet Nam. <http://dx.doi.org/10.5716/WP13046.PDF>
164. Seri Agroforestri dan Kehutanan di Sulawesi: Agroforestry dan Kehutanan di Sulawesi: Strategi mata pencaharian dan dinamika sistem penggunaan lahan di Sulawesi Selatan. <http://dx.doi.org/10.5716/WP13040.PDF>
165. Seri Agroforestri dan Kehutanan di Sulawesi: Mata pencaharian dan dinamika sistem penggunaan lahan di Sulawesi Tenggara <http://dx.doi.org/10.5716/WP13041.PDF>
166. Seri Agroforestri dan Kehutanan di Sulawesi: Profitabilitas sistem penggunaan lahan di Sulawesi Selatan dan Sulawesi Tenggara <http://dx.doi.org/10.5716/WP13042.PDF>
167. Seri Agroforestri dan Kehutanan di Sulawesi: Gender, mata pencarian dan lahan di Sulawesi Selatan dan Sulawesi Tenggara <http://dx.doi.org/10.5716/WP13043.PDF>
168. Seri Agroforestri dan Kehutanan di Sulawesi: Kebutuhan penyuluhan agroforestri pada tingkat masyarakat di lokasi proyek AgFor di Sulawesi Selatan dan Tenggara, Indonesia. <http://dx.doi.org/10.5716/WP13044.PDF>
169. Seri Agroforestri dan Kehutanan di Sulawesi: Laporan hasil penilaian cepat untuk komoditas pertanian, perkebunan dan kehutanan di Sulawesi Selatan dan Tenggara. <http://dx.doi.org/10.5716/WP13045.PDF>
170. Agroforestry, food and nutritional security. <http://dx.doi.org/10.5716/WP13054.PDF>
171. Stakeholder Preferences over Rewards for Ecosystem Services: Implications for a REDD+ Benefit Distribution System in Viet Nam. <http://dx.doi.org/10.5716/WP13057.PDF>
172. Payments for ecosystem services schemes: project-level insights on benefits for ecosystems and the rural poor. <http://dx.doi.org/10.5716/WP13001.PDF>
173. Good practices for smallholder teak plantations keys to success. <http://dx.doi.org/10.5716/WP13246.PDF>
174. Market analysis of selected agroforestry products in the Vision for Change Project intervention Zone, Côte d'Ivoire.





The World Agroforestry Centre is an autonomous, non-profit research organization whose vision is a rural transformation in the developing world as smallholder households increase their use of trees in agricultural landscapes to improve food security, nutrition, income, health, shelter, social cohesion, energy resources and environmental sustainability. The Centre generates science-based knowledge about the diverse roles that trees play in agricultural landscapes, and uses its research to advance policies and practices, and their implementation that benefit the poor and the environment. It aims to ensure that all this is achieved by enhancing the quality of its science work, increasing operational efficiency, building and maintaining strong partnerships, accelerating the use and impact of its research, and promoting greater cohesion, interdependence and alignment within the organization.



United Nations Avenue, Gigiri • PO Box 30677 • Nairobi, 00100 • Kenya  
Telephone: +254 20 7224000 or via USA +1 650 833 6645  
Fax: +254 20 7224001 or via USA +1 650 833 6646  
Email: [worldagroforestry@cgiar.org](mailto:worldagroforestry@cgiar.org) • [www.worldagroforestry.org](http://www.worldagroforestry.org)

Southeast Asia Regional Program • Sindang Barang • Bogor 16680  
PO Box 161 • Bogor 16001 • Indonesia  
Telephone: +62 251 8625415 • Fax: +62 251 8625416  
Email: [icraf-indonesia@cgiar.org](mailto:icraf-indonesia@cgiar.org) • [www.worldagroforestry.org/regions/southeast\\_asia](http://www.worldagroforestry.org/regions/southeast_asia)