



Identification of Timber Species and Origins

Inception Workshop Report

24-25 April 2012, Kuala Lumpur, Malaysia

Marius R.M. Ekué and Judy Loo



Federal Ministry
of Food, Agriculture
and Consumer Protection



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Jointly organized by

Bioversity International & Forest Research Institute Malaysia (FRIM)

Supported by

The Federal Republic of Germany

Organizing Committee Members

At Bioversity

Dr. Judy Loo

Dr. Marius R.M. Ekué

Mr. Hong Lay Thong

Ms. Riina Jalonen

Mr. Choo Kwong Yan

At FRIM

Dr. Norwati Mohammad

Dr. Lee Soon Leong

Dr. Lee Chai Ting

Dr. Tnah Lee Hong

Dr. Ng Chin Hong

Bioversity International is a world leading research-for-development non-profit organization, working towards a world in which smallholder farmers and rural communities in developing countries are thriving and sustainable. Bioversity's purpose is to investigate the use and conservation of agricultural and forest biodiversity in order to achieve better nutrition, improve livelihoods and enhance agricultural and forest sustainability. Bioversity International works with a global range of partners to maximize impact, to develop capacity and to ensure that all stakeholders have an effective voice.

Bioversity International is a member of the Consultative Group on International Agricultural Research (CGIAR) Consortium. CGIAR is a global research partnership for a food secure future.

The project "Identification of Timber Species and Origins" is a part of the CGIAR Research Program No. 6 (CRP6): Forests, Trees and Agroforestry: Livelihoods, Landscapes and Governance. This program has the clear objective of enhancing the management and use of forests, agroforestry and tree genetic resources across the landscape from forests to farms.

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Bioversity International
Via dei Tre Denari, 472/a
00057 Maccarese
Rome, Italy

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ACKNOWLEDGMENTS

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We extend our warm thanks to all of our colleagues from Bioversity-Malaysia (Jee Jee Kiu, Eleanor Gomez, Jeffrey Lim, Dorothy Chandrabalan) and FRIM for technical, administrative and logistics supports prior to, during and after the workshop.

ABBREVIATIONS

APAFRI	Asia Pacific Association of Forestry Research Institutions
BMVEL	German Federal Ministry of Food, Agriculture and Consumer Protection
CAF	Chinese Academy of Forestry
CBD	Convention on Biological Diversity
CIFOR	Centre for International Forestry Research
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CoC	Chain-of-Custody
DoubleHelix	Double Helix Tracking Technologies Pte Ltd
EFI	European Forest Institute
EMBRAPA	Brazilian Agricultural Research Corporation
FAO	Food and Agriculture Organization of the United Nations
FLEGT	Forest Law Enforcement, Governance and Trade
FRIM	Forest Research Institute Malaysia
FSC	Forest Stewardship Council
GTTN	Global Timber Tracking Network
IAEA	International Atomic Energy Agency
Ibol	International Barcode of Life
IC	Inception Workshop
ITTO	International Tropical Timber Organization
IUFRO	International Union of Forest Research Organizations
vTI	Johann Heinrich von Thünen-Institut
NGOs	Non Governmental Organizations
NIST	National Institute of Standards and Technology
PEFC	Programme for the Endorsement of Forest Certification
QA	Quality Assurance
RIL	Reduced impact logging
RMs	Reference Materials
SITE	Stable Isotope & Trace Element
SNPs	Single Nucleotide Polymorphism
USDA	United States Department of Agriculture
WRI	World Resources Institute
WWF	World Wildlife Fund

EXECUTIVE SUMMARY

The Inception Workshop of the project "Identification of Timber Species and Origins" was held in Kuala Lumpur, Malaysia from 24 to 25 April 2012. The project (Identification of Timber Species and Origins) was initiated to facilitate the practical application of timber species identification and timber tracking tools based on DNA and stable isotope markers for a number of priority timber species. This international initiative financed by Germany is led by Bioversity International from its Regional Office in Serdang, Malaysia. The inception workshop brought together 46 participants concerned about illegal logging and related trade. The objectives were to:

- Inform key stakeholders about the project "identification of timber species and origins",
- Provide an opportunity for information exchange about related projects and issues around the world,
- Identify experts and institutes working in the field and initiate discussions about building a network,
- Initiate discussions on the future database and the standard setting approaches,
- Establish an initial set of priority species to include in the database,
- Initiate discussions about the development of standards for timber species identification and origin (sampling design, sampling size, genotyping methods, stable isotopes techniques, data analysis) and the accreditation system for labs that want to work in this area.

The opening session of the workshop was marked by addresses from Dr. Leocadio Sebastian (Regional Director - the Asia, Pacific and Oceania, Bioversity International), Mr. Thorsten Hinrichs (Deputy Head of Division "European and International Forest Policy - European and International Forest Policy, German Federal Ministry of Food, Agriculture and Consumer Protection (BMELV), Dr. Judy Loo (Senior Scientist, Theme leader, Forest Genetic Resources Programme, Bioversity International) and Y.Bhg. Dato' Dr. Abd Latif b. Mohmod (Director General, Forest Research Institute Malaysia).

The **background information** summarizes the presentations related to the latest development of various legal initiatives to fight illegal logging (4 presentations); the state-of-the-art knowledge and applications of DNA (5 presentations) and stable isotope techniques (3 presentations) in species identification and timber tracking.

The second part summarizes all discussions and recommendations from the **brainstorming and project planning phase** on the following points: Priority species, database (users, accessibility, data sources, incentives to provide data, data standards and quality, data sharing agreement, cost structure, concerns, species identification, and control of geographic origin), networking (membership, incentives, organization and activities, communication strategy), standards (protocols for sampling, laboratory procedures, analytical methods, blind test, etc.), accreditation system for public and private labs and fundraising.

The third part of this report contains the perspectives of various stakeholders (international organizations, NGOs, forest certifiers, service providers, timber producer and timber consumer

countries) on the use of DNA & stable isotope techniques for timber species identification and timber tracking purposes.

All presentations and additional information on the project will be posted on the global timber tracking network website (www.globaltimbertrackingnetwork.org).

BACKGROUND, OBJECTIVES AND PROCESS

BACKGROUND AND OBJECTIVES OF THE PROJECT

Unsustainable and illegal logging, and trade in illegally harvested products causes many ecological, economic and social problems. It is estimated that up to 50% of wood exported from Amazon, Central Africa, SE Asia and Russia is illegally harvested.

Although instruments against such unsustainable and illegal practices have been established, there is a lack of practical control mechanisms to identify the origin of timber and wood products. Existing timber tracking systems use paper-based documentation of timber origin and use at all stages of processing. However, paper-based tracking of products is open to tampering; DNA and stable isotopes are innate characteristics that cannot be changed.

DNA fingerprints and stable isotopes use characteristics that are inherent to the timber instead of externally applied marks. This eliminates the possibility of falsifying accompanying chain-of-custody documents and reduces possibility of laundering timber from illegal harvest.

The project (Identification of Timber Species and Origins) was initiated to facilitate the practical application of such innovative tools (DNA and stable isotopes markers). This international initiative financed by Germany and led by Bioversity in its Regional Office in Serdang, Malaysia, aims to:

- Coordinate and facilitate research on tools to identify endangered timber species and to identify geographic origin of timber;
- Facilitate information exchange, comparability and networking among research projects, research groups and implementing institutes, especially promoting synergies and complementary work on methods using genetic markers and stable isotopes;
- Organize and establish voluntary international standards, inter alia for sampling, extraction, testing and documentation;
- Organize and set up an international open access database to trace timber origin.

OBJECTIVES OF THE INCEPTION WORKSHOP

The inception workshop brought together major stakeholders concerned by illegal logging and related trade. The objectives were to:

- Inform key stakeholders about the project “identification of timber species and origins”,
- Provide an opportunity for information exchange about related projects and issues around the world,
- Identify experts and institutes working in the field and initiate discussions about building a network,
- Initiate discussions on the future database and the standard setting approaches,
- Establish an initial set of priority species to include in the database,
- Initiate discussions about the development of standards for timber species identification and origin (sampling design, sampling size, genotyping methods, stable isotopes)

techniques, data analysis) and the accreditation system for labs that want to work in this area.

WORKSHOP PROCESS

The workshop was divided into three parts. The first part aimed at presenting the latest development of various legal initiatives to stop illegal logging and their implications for all stakeholders concerned; and to review the state-of-the-art knowledge and applications of DNA and stable isotope techniques in species identification and timber tracking.

The second part was a participatory process (project presentation with discussion, two parallel working groups addressing specific questions, reports to the plenary and discussions) to address all project activities, expected outputs and challenges.

The third part was two panel discussions addressing the perspectives of various stakeholders (international organizations, NGOs, forest certifiers, service providers, timber producer and timber consumer countries) on the overall project.

Outcomes of discussions at the inception workshop will be used by the project coordination to develop annual work plans.

PARTNER ORGANIZATION

The inception workshop was co-organized by Bioersity International and the Forest Research Institute Malaysia (FRIM).

The Forest Research Institute Malaysia (FRIM) founded in 1929 as the Forest Research Institute (FRI) was a department under the Forestry Headquarters Peninsular Malaysia. It was not until 1985 that the Institute became a statutory body governed by the Malaysian Forestry Research and Development Board (MFRDB) under the then Ministry of Primary Industries. Later in 2004, FRIM was administered by the Ministry of Natural Resources and Environment.

FRIM promotes sustainable forest management and the optimal use of forest resources through the knowledge and technology generated from research.

FRIM has five research divisions, three technical support divisions and three administrative and finance divisions. Of the five research divisions, the Forestry & Environment Division focuses on conservation of forest ecology and biodiversity by providing data, standards and guidelines in managing tropical forest on a sustainable basis. The Forestry Biotechnology Division researches ways to establish cost-effective forest plantations as an alternative and/or supplementary supply of timber. The Forest Products Division researches the utilization of ligno-cellulosic materials and promotes the development of forest based industries. The Forest Biodiversity Division focuses on the conservation of forest biodiversity by providing samples, data, standards and guidelines in

managing the tropical forest, while the Medicinal Plants Division researches the medicinal values of forest plants and product development.

Among the facilities available at FRIM are the five arboreta that serve as ex-situ conservation areas and references for forestry education, a xylarium with more than 10,000 wood samples of over 1,500 species, a herbarium established in 1908 with over 200,000 specimens, a library, a nursery, several venues for seminars and conferences.

The nine field stations located in different localities in the country also facilitate researchers conducting studies in respective areas.

OPENING AND SETTING THE SCENE

Welcome address from Bioversity International - Asia, Pacific and Oceania, Regional Office

Y.Bhg. Dato' Dr. Abd Latif b. Mohmod, Director General, Forest Research Institute Malaysia,

Mr. Thorsten Hinrichs, Deputy Head of Division "European and International Forest Policy - European and International Forest Policy, German Federal Ministry of Food, Agriculture and Consumer Protection,

Dr. Bernd Degen, Director - Institute of Forest Genetics, Johann Heinrich von Thünen-Institut,

Dr. Judy Loo, Senior Scientist, Forest Genetic Resources, Bioversity International

Friends, ladies and gentlemen,

On behalf of Bioversity International, I wish to welcome you to Malaysia and to this Inception meeting of the project on the "Identification of Timber Species and Origins". We are expecting 43 participants representing organization located in 14 countries (including Malaysia). All of you are experts on the topics that we will be discussing in the coming days.

The workshop objectives as you may be aware by now focuses on the developing a network of experts and institutes that can work together in tackling the issues and challenges of illegal logging and trade of illegally harvested timber and timber products. We are hoping that this inception workshop can initiate discussions of practical methods to identify the origin of timber and timber products.

As we are aware, unsustainable and illegal logging, and its related trade are causing economic and ecological problems in both in producer and in consumer countries.

More than 50% of wood exported from the Amazon, Central Africa, Russia and SE Asia is illegally harvested, resulting in worldwide annual losses in revenues and assets estimated between US\$ 10-15 billion. SE Asian timber producing countries shares much of these losses.

Bioversity and the German Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) in 2010 recognizing the importance of the problem on illegally harvested timber and timber products agreed to pursue this project on timber tracking. The project aims, among other things, facilitating information exchange, networking among research projects, research groups and implementing institutes.

We are therefore very thankful for your interest and support to this project, knowing very well that most you used your own resources to come to this workshop.

I wish all participants a great and productive discussion of this very sensitive issue

Leocadio Sebastian

Regional Director - the Asia, Pacific and Oceania, Bioversity International

Message on behalf of the Government of Germany

I am happy to be here today but I am even happier that all of you are here – because this workshop is about you. All of you are, in one way or another, engaged in the protection of the forest and in the fight against illegal logging. Fingerprinting can be an important tool in our common work.

I am convinced that the key for our success is coordination. Let me, at this stage express the clear political will of the German government to contribute actively to the fight against illegal logging - both at producers and at consumers' side!

Now, how comes that Germany got involved in fingerprinting for timber? This goes back as far as 2001 when we organized the first international workshop at the Federal Forest Research Institute in Hamburg. At this time we discovered exciting new possibilities with genetics.

There were promising experiences from the French vine industry which, at that time, had already successfully made use of genetic fingerprinting for European oak, of which only specific provenances were demanded for the production of French vine barrels.

There had also been scientific progress in Hamburg and other European institutes proving that DNA in sufficient quality may be extracted even from most processed timber. This is important because timber imports had changed from raw wood to processed timber during the preceding years – an increasing challenge for all certifiers and controllers and for traditional timber tracking methods

Generally the main idea of fingerprinting is not to identify the concrete places of origin, it is to verify or falsify the reported origins in the accompanying papers.

The activities from government side were complemented in the course of time by very specific activities initiated by WWF around the isotope analysis. Early on cooperation with WWF and later on also other partners was sought in order to expand the scope of activities and promote synergies.

In 2007 there was another international workshop in Königswinter, Germany, organized jointly with WWF. The Result was a clear positive feedback on the proven potential and on the cost-effectiveness of the methods.

Recommendations from this workshop were:

- To continue with genetic and isotope methods complementary to one another
- Further networking
- Scoping for an international organization to take over work on databanks and international standard setting

These recommendations served as basis and motivation for the German government and partners. Outreach activities to international organizations were started and further steps developed.

In 2010 GIZ (Gesellschaft für Internationale Zusammenarbeit) and WWF organized an International conference in Eschborn, Germany. This conference made it clear that the methods are ready. Now the time was ripe to really get into practice. Therefore Germany initiated two big projects:

- A project with ITTO about concrete fingerprinting of priority species in central Africa. This project goes beyond country levels and includes 7 African countries.
- The coordination facility with Bioversity, which is the topic of this inception workshop today.

Ladies and gentlemen,

Policies against illegal logging of various types are under development and implementation – at global, regional and national level, including governments, NGOs and the private sector. Nevertheless, the bottleneck of all these initiatives are efficient and effective tools for control at the very end of the chain-of-custody and the processing chain of timber - be it for enforcement agencies or non-governmental actors.

Germany, therefore, will continue its engagement in this field.

But other partners need also to engage themselves from the various sides – including from producer country side, from science institutes and from other donors – in order to accelerate progress to the pace at which illegal logging activities impact on a still growing number of timber species.

Coordination of efforts on fingerprinting is the key to success. I am very happy that the work has started now and Bioversity will develop the coordination facility here in Malaysia. It will be a benefit for all of us and our work.

I would like to thank the staff of Bioversity and FRIM for organizing this event! And I would like to thank you for your willingness to join forces and to help making fingerprinting a success. Together we can succeed and use these new methods in our common fight against illegal logging in exporting and in importing countries.

Thorsten Hinrichs

German Federal Ministry of Food, Agriculture and Consumer Protection (BMELV)

Welcome address from Bioversity International Forest Genetic Resources Programme

On behalf of Bioversity International's Forest Genetic Resources Programme, I am very pleased to welcome you to this Inception Meeting for the project "Identification of Timber Species and Origins".

I will say a few words about Bioversity's work in forest genetic resources, and how we fit into the global forest research arena. Then I will tell you a little more about the initiative that we are here to start.

Bioversity International is one of the 15 CGIAR Centres, which conduct research on global agricultural and forest problems, aiming to alleviate poverty, improve livelihoods of the rural poor and reduce or reverse environmental degradation. Bioversity is one of three centres that has substantial research on forests and trees. The other two are CIFOR (the Centre for International Forestry Research), represented here at this meeting, and ICRAF (the World Agroforestry Centre).

At Bioversity, our focus is on conservation and sustainable use of forest genetic resources. We conduct research on status and importance of, and threats to populations of tree species that are valuable to people and we develop guidelines and strategies for their conservation and sustainable management. We also develop training materials to strengthen capacity in FGR.

The Forest Genetic Resources Programme has about 15 regular scientific staff and several other scientists who work part time on specific projects. We have forest programme staff in Cali, Colombia; Yaoundé, Cameroon; Tashkent, Uzbekistan; and Rome, Italy; as well as here in Malaysia.

Our work at Bioversity is part of a global Research Programme on Forests, Trees and Agroforestry, which is led by CIFOR, based in Bogor, Indonesia.

We are here today to start the project: Identification of Timber Species and Origins, which aims to facilitate the practical application of genetic and stable isotope tools for tracking timber, by establishing a global data and networking centre. The project is funded by the German Federal Ministry of Food, Agriculture and Consumer Protection, and Germany is a very active partner in the project as well.

Over the next few months, Dr. Marius Ekué, Bioversity's scientific coordinator for the project, will build a network of researchers who are developing DNA or stable isotope markers for timber identification or are conducting research on related topics. He will also lead the development of a geo-referenced database with marker information for priority timber species.

By the end of the three-year project, we plan to have a set of procedural standards for use by labs to identify species and origin of timber from a number of priority tropical tree species.

By bringing together the efforts of researchers around the world, facilitating information availability for labs that will carry out forensic analysis of wood samples, and developing internationally agreed standards for the testing procedures, we hope to provide a means to enable the enforcement of new regulations that are intended to limit the trade in illegal timber.

This should reduce pressure on endangered tree species and on protected areas; we hope that it will also contribute to more stable, sustainable and beneficial development for poor rural communities in forested areas.

This initiative is global, involving countries that produce timber and countries that import timber. It is coordinated here in Malaysia out of our regional Bioversity International office but we will involve scientists and other stakeholders from all parts of the world – hopefully all of you, here in this room will become involved in the project, one way or another, as a collaborator in the science, as a Steering Committee member, as a government or non-government organization representative interested in helping to make this concept work, or simply as an advocate for the approach and for our network.

During this meeting, you may have already noticed that there is more time allocated for discussion than for presentations. That is because this is a working meeting and we have brought you together to help us. That means that we want opinions and ideas from all of you. Please do not be shy; tell us what you think about the ideas that are presented and suggest solutions when you see a challenge. We have come here to begin building a network that has exciting possibilities and a very important role to play. And the network starts with all of you.

I look forward to a fruitful and exciting workshop.

Thank you.

Judy Loo

Senior Scientist, Theme Leader, Forest Genetic Resources, Bioversity International

Opening remarks from Forest Research Institute Malaysia

Mr. Thorsten Hinrichs, Deputy Head of Division "European and International Forest Policy - European and International Forest Policy, German Federal Ministry of Food, Agriculture and Consumer Protection (BMELV),

Dr. Leocadio Sebastian, Regional Director - the Asia, Pacific and Oceania, Bioversity International,

Dr. Bernd Degen, Director - Institute of Forest Genetics, Johann Heinrich von Thünen-Institut (vTI),

Dr. Judy Loo, Senior Scientist, Forest Genetic Resources Conservation and Use, Bioversity International,

Distinguished guests, Ladies and gentlemen,

Good morning and welcome to the Inception Workshop on the Identification of Timber Species and Origins. To all participants from abroad, let me wish you "Selamat Datang" - a warm welcome to Malaysia. The Forest Research Institute Malaysia (FRIM) is honored to jointly organize this workshop with Bioversity International and the German Federal Ministry of Food, Agriculture and Consumer Protection.

Distinguished Guests, Ladies and Gentlemen,

Illegal logging is one of the main causes of deforestation, climate change and loss of biodiversity. It is a global issue that needs to be addressed urgently as it poses a threat to the sustainable forest management. A recent study estimated that illegal timber and wood products flooding the marketplace have depressed world timber prices by even to 16 percent on average. Globally, illegal logging results in annual losses of at least US\$10 billion to US\$15 billion of forest resources from public lands alone, according to the World Bank. Unless concerted action is taken, illegal logging will continue to deprive governments and local communities of significant revenues and resources, threaten forest ecosystems, distort timber markets, and act as a disincentive to sustainable forest management.

Across Asia, new logging and timber exports related regulations and policies have emerged with the goals of conserving the existing natural forests and to promote a shift towards participatory, sustainable forest management. As a leading exporter of tropical timber and timber products, Malaysia is committed to ensure the continuity of forest product flow, while conserving her complex ecosystems, rich with flora and fauna. One of the major steps taken by Malaysia to address problems of illegal logging is through her active involvement in the European Union Action Plan on Forest Law Enforcement, Government and Trade (EU FLEGT) which was designed to encourage legal and sustainable management of forests. Under the FLEGT, as of 2013, companies importing wood into Europe will be legally responsible to ensure that the wood was harvested legally. Likewise, the Lacey Act prohibited all trade in the USA with timber and timber products that are illegally sourced from any U.S. state or foreign country.

Ladies and Gentlemen,

At present, there is a lack of practicable control mechanisms to identify the origin of timber and wood products. For your information, in 2009, at the Forest Research Institute Malaysia, we have established the STR profiling database for *Neobalanocarpus heimii* (chengal) and more recently for *Gonystylus bancanus* (ramin). The database is the first reported for tropical timber species. Similar work is on-going for a few other timber species of economic importance such as *Koompassia malaccensis* (kempas) and *Shorea platyclados* (meranti bukit). In addition, we have also started a project on the development of DNA barcodes for the identification of important timber species in Malaysia, in line with the global movement of curbing illegal logging and associated trade.

The availability of DNA profiling databases of important timber species in Malaysia will enhance the capacity of Forest Department officials in the conviction of illegal loggers under Section 15, National Forestry Act 1984 (amended 1993). For the timber industry in Malaysia, the DNA profiling databases can be used to certify that a wood product is genuinely derived from planted or sustainably managed forests so that the wood product is able to penetrate international markets with higher selling price. In addition, the results published in international journals shall demonstrate the commitment of Malaysia on the global issues of conservation of forest resources.

At the moment though, there is a need for population and individual identification databases to be established for premium timber and for these to be used as benchmarks in ongoing scientific developments in the near future. However, overcoming the need for these databases and tracking system in all commonly traded Malaysian timber (408 species are known in the international market) will be an extremely challenging task.

Ladies and Gentlemen,

We are glad that Bioversity International has initiated the project on Identification of Timber Species and Origins, which aims to find a scientific system that is repeatable and precise, using DNA markers and stable isotopes to track the origin and species of timber, as part of a wider effort to establish international standards for the practical applications of timber tracking tools. It's a real honor for FRIM to be invited to collaborate in the project.

This inception workshop has gathered scientific experts in the field, representatives from relevant NGOs and forest enterprises, regional and international organizations as well as forest administrations from 13 countries which consist of both major timber producer and timber consumer countries. It provides an avenue for the sharing and exchange of invaluable knowledge and information among scientists, policy analysts and the relevant stakeholders. Participants will be able to discuss on issues pertaining to the setting up of database, development of standards for timber species identification and geographical origin, the prospects, challenges and way forward.

I believe that through this workshop, not only will the stakeholders be updated with the state of the art technology and its applications, networking and technology transfer among the experts and institutions working on this subject will be enhanced. And I am convinced that with the same goal of combating illegal logging, each of us can play a role to protect the forests. Let not the challenges deter our commitment to conserve the forests and leave a legacy for future generations to enjoy.

Last but not least, I would like to thank the committee members, both from Bioversity International and FRIM, for their untiring effort in making this inception workshop a success.

With that, Ladies and Gentlemen, I wish you a fruitful discussion and hope that the workshop will achieve its objectives in drawing guidelines and recommendations for practical applications towards a more efficient and robust timber tracking system in the context of global forest stewardship. And to all foreign participants, I wish you an enjoyable and pleasant stay in Malaysia.

Thank you

Dato' Abd. Latif Mohmod

Director General - Forest Research Institute Malaysia (FRIM)

Review of the meeting agenda

Marius summarized the objectives of the project “identification of timber species and origins” which is to facilitate the practical application of timber tracking tools using genetic and stable isotope fingerprints for a number of priority timber species.

He then presented the objectives of the inception workshop aiming to a) inform key stakeholders about the project, b) provide an opportunity for information exchange about related projects and issues around the world, c) identify experts and institutes working in the field and initiate discussions about networking, d) initiate discussions on the database, e) exchange ideas on criteria for prioritizing species and f) initiate discussions on the development of standards for timber species identification and geographic origin.

He then gave an overview of the agenda (Annex 1) and pointed out that more time was allocated intentionally to stimulate discussions rather than just listen to presentations. He urges everyone to participate actively.

Marius R.M. Ekué

Scientific Coordinator, Identification of Tree Species and Geographic Origin, Bioversity International

BACKGROUND INFORMATION

LEGAL INITIATIVES TO FIGHT ILLEGAL LOGGING

Chair: Bernd Degen

Thorsten Hinrichs presented the EU initiatives to fight illegal logging and the role of fingerprinting techniques. The EU has initiated the Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan since 2003. It is a set of measures covering several areas including the support to timber producing countries (EU-FLEGT Regulation), the harmonization of EU's countries public procurement policies and the EU Timber Regulation.

The EU FLEGT Regulation started in 2005 with the negotiation of binding bilateral agreements called Voluntary Partnership Agreements (VPAs) with individual tropical timber producing countries. Exporting countries develop legality assurance systems with the support of the EU. When the system will be fully operational, only tropical timbers with FLEGT certificates will be allowed into the EU market. As of July 2011, 10 African and south Asian countries have either signed or are at different negotiation stages with the EU to sign a VPA.

The EU Timber Regulation (which also integrates the FLEGT regulation) was initiated in 2010, and encompasses all timber regardless of its origin. It integrates the FLEGT Regulation and will come into force the 3rd of March 2013. The regulation prohibits the placement of illegally harvested timber and timber products on the EU market. The first operator placing any timber and timber products into the EU market will have the obligation to provide information about their suppliers and clients. This mandatory use of the Due Diligence System (DDS) will be under the control of an independent Monitoring Organizations (MOs). They will be an integration with existing confirmations such as the CITES permits, certification, national legislation etc. Competent EU authorities will control the MOs and operators by checking their DDS (documents, spot checks, field audits). In case of violation or non compliance, there will be remedial actions (seizure of timber, prohibition of marketing) and penalties (fines, permanent seizure and prison).

Thorsten Hinrichs then mentioned the role of fingerprinting techniques (DNA and stable isotopes) as a practicable control method not open to tampering, compared with the existing systems (paper-based, tagging and wood anatomical identification). DNA and stable isotope fingerprinting techniques will be useful for authorities in both consumer and producer countries (as part of legality assurance systems), operators and traders (to control the chain-of-custody) and for third party verification. But before that, there is a need to foster international cooperation through the coordination facility (Global Timber Tracking Network) run by Bioversity International.

Shelley Gardner talked about the US Forest Service (USFS) initiatives to combat illegal logging and associated trade. She mentioned that the whole US forest and forestry approach value and take into account the multiple goods and services of forest ecosystems by promoting sustainable forest management, addressing the underlying causes of deforestation, supporting participatory approaches, basing policy on the best available science and strengthening transparency and accountability in the international trade in forest products.

The U.S. has undertaken many efforts to strengthen forest governance and combat illegal logging and associated trade. Efforts include the conclusion of MOUs with Indonesia and China, commitments in trade agreements; bilateral and regional assistance for forestry; support for the International Tropical Timber Organization (ITTO), the Responsible Asia Forestry and Trade (RAFT) and the Forest Legality Alliance; the 2008's amendment of the Lacey Act with the ad of enforcement tools and the investment in legality assurance technologies.

The USFS tools and technology to combat illegal logging include forest inventory and monitoring, timber tracking and wood identification. The timber tracking tools vary for domestic use (low-tech integrated system) and international (higher tech approach, IT-, GPS-based, computerized CoC systems).

The USFS has various initiatives and international collaboration in the use of wood science to meet legislative and market requirements. It includes the use of wood anatomy (with classical laboratory analysis, fiber testing, field identification manuals, training, automated wood ID), fingerprinting methods (DNA, stable isotopes), the integration of technologies and their application as well as the technology transfer and outreach. Existing facilities at the USFS (National Forest Genetics Laboratory and the US Fish & Wildlife Service National Forensics Laboratory) are using DNA fingerprinting techniques in timber tracking.

Finally she mentioned that the USFS is currently supporting a pilot project "timber tracking and species identification of Russian larch and Mongolian oak Russia-Germany-US"; and another pilot project on Honduras's bigleaf mahogany is in preparation.

She saw the way forward by more collaboration through investment in R&D, technology transfer and outreach (public—private partnerships); and exchange with international initiatives such as the International Barcode of Life (iBOL), the Tree Barcode of Life (TreeBOL) and the Global Timber Tracking Network (GTTN).

Aimi Lee Abdullah from the European Forest Institute (EFI) - FLEGT Asia based in Kuala Lumpur talked about FLEGT activities in the region. She reminded us about the FLEGT Action Plan and specifically the EU Timber Regulation which will become operational the 3rd of March 2013. FLEGT is supported by a very substantial financial effort from the European Commission and EU member states so far spending at least 150 million Euros on related programmes and projects.

FLEGT Asia is active in 11 countries of the Asia-Pacific Region. They are collaborating with EU delegations and embassies in producer countries and are providing information on FLEGT and VPAs. Once a country indicates formally its interest for the VPA, the EFI delegates a special international team to assist in the preparation and negotiations. FLEGT Asia has a regional advisory group to discuss and define realistic objectives and approaches and sets priorities. Indonesia is the first Asian country to sign a VPA agreement while Malaysia is in advanced negotiations stage.

Johannes Zahnen explained that the World Wildlife Fund (WWF) mission is the conservation of nature using the best available scientific knowledge, and building a future in which human needs are met in harmony with nature. He observed that during the last 50 years, 50% of the world's forests have been destroyed and illegal logging is one of the main drivers. He pointed out some problems caused by illegal logging (15-20% of carbon dioxide emission, 20-40% of global wood production). From the existing wood tracking technologies (e.g. Branding hammers; nail based labels, RFID etc.) or verification certificates (e.g. proof of legality, third party verification, paper-based document), misuses of technologies and certificates cannot be excluded.

Only the combination of all chain-of-custody (CoC) documents with independent verification methods will strengthen the timber tracking systems and make it more transparent. New verification methods to control the declared wood origin (DNA and stable isotopes), and for species identification (such as timber sniffer dogs) are necessary to be used as indicators. Such methods will be beneficial to authorities (to implement regulations), companies (to control suppliers) and protected areas (to combat illegal logging). But there are some preconditions for DNA and stable isotope fingerprinting to become a reality such the elaboration of an international reference database (Non-profit, open to all countries and stakeholders, reliable) and a standardization of labs and techniques. Knowledge about the origin of timber is not sufficient but always a pre- condition to make a statement regarding its legality.

Q & A

- Once a country has signed a VPA, is that sufficient to assure the legality of its timber? Will there be further checks? (Bernd Degen)
 - Products from VPA countries need only to be accompanied by a FLEGT certificate, and the product must match exactly the information on the certificate (Thorsten Hinrichs)
 - VPA license may not cover all wood products (Aimi Lee Abdullah)
 - VPA countries need to have a legality assurance system in place. Legality assurance system can be helpful to countries since they may expand the system to trade also with non-EU countries and domestic trade (Thorsten Hinrichs, Aimi Lee Abdullah)
- What is the difference between the Lacey Act and the EU legislation in terms of responsibility along the supply chain? Who is fined when illegal wood products are detected? Is it the importer or the supplier? (Andrew Lowe)
 - In the US, many procedures are not yet in place. But there was one case where an anonymous tip led into investigations, and the importer was found guilty. When the importer is known, it might be possible in theory to move down the supply chain but that can be complicated (Shelley Gardner)
 - For the EU, the importer has the obligation to provide documentation assuring the legality of the product. However the importer maybe interested in passing on some of the risks to the suppliers (e.g. by requiring suppliers to sign a document assuring legality). In the timber regulation, only the first operator placing the

timber in the market have the obligation to prove its origin (Thorsten Hinrichs, Aimi Lee Abdullah)

- VPA negotiation is a long process, how effective is it in controlling illegal logging? (Judy Loo)
 - The EU does not ask for complete reforms or reinventing what exist already. The negotiations build on what is already in place in each country, by addressing gaps to build a timber legality assurance system. When there is nothing in place, then the negotiations take more time (Aimi Lee Abdullah).
 - The negotiations are not only about legislative process, they are also some political aspects which make them complex. But the long duration of the process shows that issues are taken seriously and the changes are not superficial (to comply with regulations) but are real improvements. Indonesia would have its VPA ready by March 2013, and hopefully Ghana and Cameroon as well. The EU has less pressure about the duration of the VPA negotiations because the timber regulation is already in place (Thorsten Hinrichs).
- Is there any negotiation going on with Brazil? Although 80% of Brazilian timber harvested is for domestic consumption, 20% is exported (Milton Kanashiro)
 - Negotiations have not started since Brazil appeared not to be interested by the VPA (Thorsten Hinrichs)
- How is the sniffer dogs trained? (Milton Kanashiro)
 - Frankfurt International Airport is already using sniffer dogs to detect illegally exported animal products. It is a good technique for non destructive control (e.g. guitar costing EUR 2000 cannot be destroyed for control of the wood species used to make it). The dogs trained (he showed the video of the training) were able to distinguish mahogany, khaya and sipo (Johannes Zahnen)
- Could you explain how serious are the US authorities involved in Lacey Act and the EU authorities involved in timber regulation & FLEGT in using new technologies for regulation? How much interest is there at high level? (Darren Thomas)
 - They are taken seriously in the US. A number of agencies are responsible for enforcement of timber regulations which reinforces our interest and commitment. Our partners in the State Department and the US Agency for International Development (USAID) are also involved in the process. The US is very interested in developing science based methods. Methods using wood anatomy are being tested with customs and other relevant stakeholders, and the same could well be done with DNA and stable isotope methods (Shelley Gardner).
 - In EU, it's up to each Member State to do the control. Many countries are busy currently integrating their laws. France is busy setting up information for timber importers; the UK is developing documents explaining the timber regulations; Germany is investing in fingerprinting; but at the end the techniques will be used by all member States. (Thorsten Hinrichs)
- DNA and stable isotope methods are still under development. Which practical tools are the EU going to use for verifying origin? Methods development needs financial support; who will pay for that? (Suchitra Changtragoon)
 - Not all methods can be fully operational by 2013. But DNA and stable isotopes are the most effective and simplest tools. We hoped that by the end of the project,

the methods will be ready to use for a number of species. The cost will have to be shared, and already there are several projects going on to support the methods development (e.g. the ITTO project in Africa). Data sharing through the database is very important, as there would be no need to collect data every time. Producing countries need to allow scientists to sample materials. The importers can take a sample and compare it with the database in case of doubt. Anyone can do the verification including the end users (Thorsten Hinrichs).

- Data are already available for some species and we can start using them while continuing working on R&D; not only the governments but also the private sector should be involved (Shelley Gardner)
- In tropical countries, the key concern is perhaps the high number of species and developing markers for all is not possible (Milton Kanashiro)
 - Methods need not be in place by 2013 to support verification. Fingerprinting methods will be applied in case of doubt but not in all cases (Thorsten Hinrichs).
- What proportion of wood imported into EU is controlled? Is that expected to change with the new legislation? (Manfred Groening)
 - It is difficult to give an exact estimate. Currently there is no real control as the regulation is not enforced yet. There are some concerns that member states are controlling differently, some are very strict and others not enough. Consultations will be held regularly in Brussels and member states will be expected to report on how the control is done. Import data could then be combined and analyzed (Thorsten Hinrichs)
- How well does the Lacey Act work? (Yin Yafang)
 - The Lacey Act was amended to include timber fairly recently in 2008. It is difficult to evaluate the effect yet. There has been one case of seizure of timber from Peru so far. For wildlife, it is working well (Shelley Gardner)

DNA BASED TECHNOLOGIES FOR WOOD & WOOD PRODUCT VERIFICATION

Chair: Norwati Mohammad

Andrew Lowe presented practical examples for four types of verification of origin and species. DNA technologies offer the opportunity:

- To verify the integrity of a supply chain by using DNA fingerprinting techniques to track individual logs from the sawmills back to their harvested zone,
- To verify the sustainable source (concession of origin) by population genetics studies,
- To verify the country source (regional origin) by phylogeographic analyses: here he mentioned that phylogeographic maps exist for over 20 species worldwide,
- To verify the species origin by using DNA barcoding techniques. The International Barcode of Life (IBOL) aimed to generate a unique DNA barcode for 500,000 species including 100,000 plants. Plant DNA barcodes are useful for timber species identification but can also accurately estimate species richness in poorly known floras. Local DNA barcodes can also be developed for timber species identification purpose (already done for mahogany).

He mentioned the main challenge for the use of barcodes in timber tracking as the extraction of DNA from wood which contains many secondary compounds. It is better developed for temperate species than tropical species. While it is possible to extract DNA from raw timber, sawn timber, solid product and even ancient wood, it is still difficult for composite products, pulp and paper where the DNA is highly degraded. He provided technical advices for successful DNA isolation from wood. Finally he concluded that DNA is useful to provide timber producers, consumers and suppliers an independent verification of the supplier chain.

Bernd Degen started by reminding us of the many problems caused by illegal logging and associated trade; and the legal initiatives to reduce them. Controlling illegal logging requires actions at different level & scales: the identification of species involved in trade (necessary to control logging of protected and endangered species), the control of geographic origin [necessary to control the declared origin at micro (concession, landscape, protected area) and macro (country) levels] and the control of the chain-of-custody (to track individual log from the production forest to the final destination).

- To **check species identity**, he presented the results of the DNA barcoding project of CITES protected species and how the information generated were used to convict a German timber company that was trading *Swietenia mahogany* under the name of *Swietenia macrophylla*.
- To **check the declared country of origin**, he shared results of the project "Elaboration of a genetic reference database to control the country of origin of *Swietenia macrophylla*" conducted in Central and South - America. A genetic reference database (based on nuclear and chloroplast microsatellites markers) was generated from 2038 trees belonging to 33 populations sampled in 10 countries in the region. The genetic reference database showed clear geographic patterns for most of the 150 observed genetic variants. Some of the genetic variants are completely different among Central and South-America.

Blind tests conducted with 20 mahogany wood samples from the timber trader *Theodor Nagel* showed perfect matches. He gave also the example of pilot project on larch (*Larix decidua*) in Russia and the ongoing genetic reference database for merbau (*Instia* sp.) in South East Asia.

- To **check the concession of origin**, Bernd shared results of a project conducted in forest concessions in Cameroon on Sapele (*Entandrophragma cylindricum*) and Iroko (*Milicia excelsa*). Results showed clearly a differentiation at the concession level and was supported also by the blind test conducted with samples provided by WWF was also consistent.

Finally, he mentioned the new International Tropical Timber Organization (ITTO) project in Africa.

Lee Soon Leong shared results of the DNA profiling database to verify the legality of suspected timbers conducted at FRIM. FRIM is engaged since 2007 in the development of DNA profiling databases for four important timber species in Malaysia (*Neobalanocarpus heimii*, *Gonostylus bancanus*, *koompassia malaccensis* and *Shorea platyclados*). Lee explained in details the methods being used to establish the databases for identification at species, population and individual levels. DNA barcodes are already available for half of the 408 Malaysian timber species known in the international market. They have also conducted a thorough investigation of the extraction of DNA from dry wood of ramin (*Gonostylus bancanus*). Both the CTAB and DNeasy Plant Mini Kit (Qiagen) protocols were successful in extracting DNA from dry wood but the DNA quality was affected by wood preservation over time. To have quality DNA, Lee recommended doing the extraction within 6 months after felling from both log and stump. He finished by drawing attention to the importance of conducting ring tests across laboratories (e.g. allelic ladder for microsatellites).

Yoshihiko Tsumura presented the molecular database for classifying *Shorea* species. He explained that because more than 50% of *Shorea* species have a restricted distribution range, species identification may lead to identify the population of origin. More than 90% of *Shorea* species are identified using chloroplast DNA sequences. With Single Nucleotide Polymorphism (SNPs), it was possible to identify the four wood color groups of *Shorea* (white meranti, yellow meranti, balau and red meranti). There were however some limitations on species identification in case of hybrids and species from closely related genera. He explained that because *Shorea albida* has lower import tax rate in Japan, some timber traders used to declare other red meranti species as *S. albida*. But they can no longer do that because two regions of the chloroplast genome showed specific SNPs distinguishing clearly *Shorea albida* from the other red meranti species. For widespread species such as *Shorea leprosula*, population identification was also possible. He also shared results and experiences of species identification from wood products. Short DNA fragments could be amplified from plywood samples. Sequence data of trnL intron was used to assign individuals at the genus level (e.g. *Hopea*) but not at the species level.

In his presentation entitled "Reference-free comparative analysis of genomic data using ramin as an example and thoughts on species selection", **Charles Cannon** talked about how ultra high through-put sequencing technologies are revolutionizing genetics and how the direct analysis of genomic data without the need of assembled genome greatly simplifies studying 'unknown' genomes, like timber trees. With the reference free flow, it is possible to analyze directly the next generation sequencing data and assemble only what's relevant for the research questions. This reduces greatly the complexity of the analysis, given a specific comparative question. No assembled reference genome is needed, thus reducing cost. Software and python free scripts for performing the analysis are freely available. Preliminary results of an application to ramin (*Gonystylus bancanus*) showed hundreds of SNPs per sample, candidate markers typically short (less than 15 base pairs) making sample degradation less of a problem and good candidates for various screening platforms, bypassing the problems of PCR amplification. He finished by sharing some biological and biogeographical considerations to take into account for target species of DNA fingerprinting.

Q & A

- What is the cost of the analyses? (Wickneswari Ratnam)
 - (i) Fixed cost – development of maps of unknown species. In average US\$ 1000-2000 per sample location. In the ITTO funded project in Africa, a quarter of the project budget goes to sampling for reference data. (ii) Marker development is rapidly decreasing in cost, and is currently approx. US\$ 5000 for nuclear markers. (iii) Extraction of DNA from fresh and processed wood varies. The cost of the analysis is approximately 100-200 USD per sample. (Bernd Degen)
 - Costs will reduce through optimization; however the cost is lower than the value of timber. (Andrew Lowe)
 - It's good to anticipate the genomics approaches as many of the current barriers can be expected to disappear in the coming years. Much lower coverage and less repetition will be required. Cost would not be a challenge but rather how to handle data. (Charles Cannon)
- What level of accuracy would be acceptable in identification of species and timber origins? (Suchitra Changtragoon)
 - Usually, there's a claim of species and origin in the documentation accompanying wood products. It seems possible to achieve 100% accuracy on species identification. Similarly for country of origin the accuracy may be close to 100% but samples coming from countries' border regions are more difficult. For individual log tracking, a high level of accuracy is expected. (Bernd Degen)
- How to elaborate the same standards when different groups are working on different genes? (Suchitra Changtragoon)

- Genomes consist of billions of base pairs – which ones to focus on (RPO, ITS, RBCL)? Chloroplast microsatellites are often used for phylogeography involving maybe 20 genes. For population level, sequences of primers, and sequences of alleles would be ideally needed. (Andrew Lowe)
 - Heteroplasmy is a problem for analyses – how to address it? Closely related species (e.g. dipterocarps), most markers used now are from the chloroplast region. It's possible to identify recent hybridization. (Lee Soong Leong)
 - Phylogeography is important; some candidate priority species for the database could easily be crossed over because of extremely high gene flow. (Charles Cannon)
- Why is there a lower import tax for some *Shorea* species in Japan? Is it to favor the import of some species? (Thorsten Hinrichs)
 - The reason behind the different taxation is unknown. For one group of *Shorea* species it's 6% and the second group it's 8%. (Yoshihiko Tsumura)
- Does the rapid development of genomics mean that we no longer need reference maps? (Thorsten Hinrichs)
 - It's easy to add data to the database which build on the new genome sequencing approaches, and the database is further refined in the process. (Charles Cannon)
 - New generation sequencing techniques are revolutionary. Focus should be on the polymorphic regions of the DNA. A prize has been announced to reward the first group who will sequence the human genome in less than 100 days at less than US\$ 100; and many companies are currently competing for that. This illustrates how cheap genome sequencing is going to be soon. (Andrew Lowe)
 - How to get samples to create the database is crucial. Collaboration among countries would be very important (Lee Soon Leong)
- Would the methods work for both diploid and polyploid species? In the Amazon very little is known about species before studying them and often the results are surprising. (Milton Kanashiro)
 - It depends on the molecular markers used. For chloroplast markers there is no problem but for nuclear microsatellites, with a polyploid species it's complicated to analyze at population level. Matching logs and stumps is not affected by any methods. (Bernd Degen)
- To get buy-in from producer countries to the project, one approach is perhaps to back away a little bit from the enforcement aspect and emphasize the benefits of fingerprinting techniques for producer countries. (Charles Cannon).

STABLE ISOTOPE BASED TECHNOLOGIES FOR WOOD & WOOD PRODUCT VERIFICATION

Chair: Wickneswari Ratnam

Markus Boner explained that stable isotopes (e.g. hydrogen, oxygen, nitrogen, carbon, sulfur, strontium etc) are the physical fingerprints of nature and can be used to trace the origin of timber at concession, country and regional levels. He shared results of studies conducted on spruce from Boreal forest, teak and mahogany from tropical Asia and Central America, and sapelli and iroko from Cameroon. The stable isotopes used were able to identify unambiguously the concession of origin and results were supported by a positive blind test. He stressed the importance of making a wide reference sampling going beyond countries' political boundaries. The precision of the stable isotopes depends on the amount of data in the database. Stable isotopes can also be combined with near infrared (NIR) imagery for a better visualization. When some species have similar water balance and similar physiologic structure, they may display similar isotopic ratio patterns. In that case, it is possible to transfer the data generated for one species to the other.

Simon Kelly presented the results of a project of tracing the origin of food commodities in Europe (Trace) with stable isotopes. He explained that like timber, food adulteration and misdescription have financial implications. In fact, the World Customs Organization estimated that counterfeit food and beverages accounted for US\$ 49 billion in 2004. Trace (funded by the European Commission) was designed to develop traceability methods and systems that will provide consumers with added confidence in the authenticity of European food. The project was focused on commodities such as mineral water, olive oil, honey, wheat, lamb, chicken and beef. Approximately 12,000 groundwater, soil and food samples collected from 21 model sampling sites were analyzed; and geo-climatic modeling was done to produce specification prediction models. Key outputs were an improvement in traceability (improved data interchange, good traceability practice, application and demonstration in industry, interactive portal to trace your food, consumer behavior), and verifying origin (objective evidence of geographic origin, food assurance systems, and generic methods for individual species/variety). He mentioned the case of the EU wine databank. Simon made parallels with the timber origin studies and said that stable isotopes can verify origin but requires: (i) access to authentic reference samples to establish a reliable database or library, (ii) reproducible stable isotope methods that allow participating labs to contribute to a central database and (iii) reliable and enforceable methods of elaborating data to ensure consistent origin interpretation. Finally he mentioned the recently funded one year pilot project to develop Stable Isotope & Trace Element (SITE) fingerprinting to verify the declared origin of wood of teak (*Tectona grandis*) and mahogany (*Swietenia macrophylla*, *S. mahogany* and *S. humilis*).

Manfred Gröning spoke on the standardization of wood stable isotope fingerprinting. Since the mid 1960s, the International Atomic Energy Agency (IAEA) is playing a leading role in coordination, production and distribution of stable isotope reference materials in cooperation

with the US National Institute of Standards and Technology (NIST), the organization of inter-laboratory comparisons and proficiency Tests, the organization of international experts meetings on reference materials (RMs) for stable isotopes of light elements and on associated quality assurance (QA) activities and the dissemination of information on analytical QA. IAEA have more than 50 stable isotopes RMs used for water resources, agriculture, biology, geology, medicine, forensics, etc. He then presented some data on stable isotope ratios of oxygen, carbon, hydrogen. IAEA stable reference materials are used as calibrators and even in defining the conventional scales. Manfred explained also why so many references materials are needed and the problems for wood reference materials (inhomogeneity, hygroscopy and isobaric interference during analysis. He recommended for the next steps: (i) two possible wood standards preparation in test quantities – a first assessment by six labs initiated - and if found suitable, the preparation of several kg of each material to keep supplies for more than a decade; (ii) providing further continental wood samples to span a larger isotope ratio range necessary for calibration of such measurements; (iii) the calibration of all materials versus international reference materials using state-of-the-art techniques

Q&A

- What about the cost of the analysis? (Judy)
 - Five samples per location are usually sufficient to establish a reference map. The cost depends also on the number of isotopes studied. In general the cost is about EUR 200-300 per sample for identifying origin (Markus Boner)
- How reliable actually are hydrogen and oxygen isotopes if samples absorb water from different locations? (Thorsten Hinrichs)
 - Water absorption is somewhat an issue but it can be handled. There are methods for eliminating local effects. The analyses do not consider chemically bounded (last absorbed) water but instead hydrogen and oxygen in carbohydrates bound during tree growth. Differently handled samples have been tested several times but there were no significant difference in the results. Studies are being conducted in collaboration with IAEA on how to measure and correlate isotopic ratios in samples (Markus Boner, Manfred Groening)
- Is there any comparison already made between the two methods? Or is there any algorithm to combine both fingerprinting methods? (Wickneswari Ratnam)
 - It will be the next step (Markus Boner)
- How transferable are the methods from one species to the other? (Suchitra Changtragoon)
 - Variation can be found even in individual trees from the same species under similar conditions and this must be established from the beginning. (Manfred Groening)

- There is a chance to transfer the stable isotopes results of one timber species to another one growing in the same area but this has to be tested (Markus Boner)
- Species identification is a big issue in the Amazon, and changes in taxonomy are not uncommon. Some mahogany species grow in different habitats with different hydrology. (Milton Kanashiro)
 - Transferability needs to be tested, including for generalist species which occur in different habitats. However transferability does not depend on species taxonomy but rather species physiology (Markus Boner)
- Climate change is expected to alter rainfall patterns in many regions worldwide. Would that affect the reliability of isotopic methods for O and H? (Riina Jalonen)
 - Use of several isotopes can help overcome such problems. Changes in seasonality of water cycles are expected but the isotopic patterns would not change completely. Instead, isotopic ratio of C in the atmosphere is constantly reducing, for reasons that are not yet understood (Markus Boner)

BRAINSTORMING AND PROJECT PLANNING

PROJECT PRESENTATION AND GENERAL DISCUSSION

Marius Ekué presented in detail the project and keys issues to be addressed by participants at the inception workshop. Funded by the German Federal Ministry of Food, Agriculture and Consumer Protection and based at Bioversity International's Regional Office in Serdang, Malaysia, the project aims to (1) coordinate and facilitate research on tools to identify species and geographic origin of timber; (2) facilitate information exchange, comparability and networking among research projects, research groups and implementing institutes, especially promoting synergies and complementary work on methods using genetic markers and stable isotopes; (3) organize and establish voluntary international standards, inter alia for sampling, extraction, testing and documentation; and (4) set up an international database for tracing timber species and origin.

The Global Timber Tracking Network (GTTN) will be the platform to promote the integrated use of DNA & stable isotope fingerprinting techniques with the existing timber tracking systems, certification standards, regulations and legislation to ensure legal timber trade and curb illegal and unsustainable logging. The keys issues to address are related to the database (structure, accessibility, data sharing agreements, longevity, cost structure, ring & blind tests, etc.), the network (collaboration among contributing experts and institutes, integration with existing tools, data sharing), and the standards (for sampling design, sampling size, genotyping methods, stable isotopes techniques, data analysis etc.).

A general discussion has followed and some issues and questions have emerged to be added to the list of key issues to be addressed for the rest of the day.

RECOMMENDATIONS FROM THE PROJECT PLANNING

Recommendations resulting from the general discussion and groups' works are summarized below

PRIORITY SPECIES

Some possible *criteria* suggested to prioritize species are:

- International trade (volume, revenue): the annual review and assessment of the world timber situation published by ITTO can be useful source of information,
- Endangered species (e.g. CITES listed timber species),
- Species having molecular markers already developed,
- For timber species identification (barcoding), there is no need to make priority.

DATABASE

GENERAL ISSUES

USERS

Potential users of the database are the custom services, certification bodies, services providers, timber traders, governments' agencies, NGOs, academics and research institutes.

ACCESSIBILITY

Some participants argued that the database should be open and freely accessible to everyone. There were however concerns about potential misuses (companies carrying out illegal logging or trading illegally having access, use for other purposes, non-published data / results from participating labs). Therefore, recommendations included:

- Any user of the database should register first, sign a disclaimer before being granted permission,
- The database should not be completely accessible: information such as coordinates of individual trees will not be displayed,
- Only accredited laboratories (participants to the ring tests) can have access to metadata.

DATA SOURCES

Obtaining data from different countries and regions will be a great challenge. Field collections are expensive and require financial supports from developed countries. Data already available can be obtained from sources:

- Available literature (publications, reports, theses etc.),
- Research institutes from both timber producer and timber consumer countries,
- Accredited laboratories.

INCENTIVES TO PROVIDE DATA

Some incentives for countries accepting to share information are that it will support trade within the country and they will have preferential access to the European market.

For research institutes and labs sharing data, there will be a rule for data citation and they can be accredited more easily and helped the services providers.

DATA STANDARDS AND QUALITY

- Peer review:
 - May not be necessary for already published data available from peer-reviewed journals. However, published data are quite aggregated and Bioversity will have to contact the authors to get the original dataset. But a secondary quality check is needed before insertion into the database
 - Should be mandatory for non-published results
- Peer reviewers can be members of the GTTN working groups, or other experts in the field/region/species/techniques.

Some participants expressed concerns about being too strict with the quality of the existing data because we may end up not having enough information for the database. A level of flexibility should be exerted in the data quality in the beginning.

- Need to define a format (cf. Standards)

DATA SHARING AGREEMENT

A data sharing agreement is important and should address among others:

- Any legal issues and concerns of timber producer countries about putting data generated from samples collected within their countries in a centralized database,
- To convince and ensure research institutes, partners and countries that the data will be use only for timber tracking and species identification purposes.

COST STRUCTURE

- To support long-term maintenance (after the end of the 3 years projects), data users may have to pay to support the growth (addition of new species) and long term maintenance of the database.
- The Food and Agriculture Organization of the United Nations (FAO) is willing to host the database at the end of the project if needed.
- Some international NGOs (e.g. WWF) can put pressure on timber importer to pay for the maintenance.

CONCERNS

Some concerns mentioned are:

- Potential misuses of the data (mentioned above)
- Intellectual property rights issues: concern was raised about putting national data into international domain especially the central database.

Steps should be taken into account to overcome such concerns:

- Involvement of producer countries from the beginning: it's good that the process is coordinated by an international research institution (trusted by all stakeholders), and they are regional workshops planned for each continent,
- National research institutes/labs from timber consumer countries should also be involved in the development and they should be strengthened,
- Service providers should make use of national laboratories, and let the controls be done locally,
- Participant research institutions are encouraged to develop or simplify the techniques to the level that they can be used in the field or can be used in small equipped labs.

SPECIFIC ISSUES

SPECIES IDENTIFICATION

- There is a need to make a literature review and summarize available wood anatomy and barcode data of timber species
- The database can be linked to existing wood anatomy software for species identification
- Use standards of the BOLDSYSTEMS database for species (botanical species name, genus, family, commercial name, name of genes, primers, DNA sequences)
- Geographic origin information of each sample should be stored because there might be variation in the DNA sequences within species
- Collection of vouchers specimens is necessary.

CONTROLLING GEOGRAPHIC ORIGIN

- A metadata on sampling (which institution, purpose of the data collection, etc.) should be stored in the database (cf. Standards)
- Metadata on the lab that produced the data should be stored
- Geographical coordinates (specify the format) of each tree sampled should be stored
- For DNA
 - Data on every individual genotype is important for the assignment programmes
 - Information on the gene markers used for fragment data we need sequence data for the reference alleles:
 - Sequence information, chloroplast variation, SNPs data are welcomed
 - RAPD data will not be accepted because of their drawbacks
 - AFLP more reproducible and may be included
 - Use standards and guidelines for wildlife forensic as an example
- For stable isotopes
 - Data for each individual and standard deviation,
 - Information on isotopes (hydrogen, oxygen, sulfur) used
 - Use standards of other stable isotope databases
- For both DNA and stable isotopes
 - The database should be designed to run online analyses on the background and provide results with interpretation and confidence interval to the users. The system must combine together the data, the analyses and the interpretation.
 - The database should accept coordinates in different format and be able to transform them automatically.

NETWORKING

The networking will be done through the Global Timber Tracking Network (GTTN). The structure of GTTN will include different working groups (stable isotopes, DNA, policy, advocacy etc.) allowing members to contribute from their expertise and perspectives.

MEMBERSHIP

There should be no membership and registration fees. The GTTN website should feature the logos and contribution of participant's institutes/individuals to the development of the tools.

INCENTIVES

- The GTTN website can serve as a depository centre for articles, publications, videos, proposals for research, funding opportunities for students willing to work with DNA and stable isotope tools,
- Elaboration of some performance indicators for contributing institutes and partners.

ORGANIZATION AND ACTIVITIES

- Meetings, newsletters, webpage;
- Contacting and using list serves of organizations such as APAFRI (Asia Pacific Association of Forestry Research Institutions), IUFRO (International Union of Forest Research Organizations) and IAWA (International Association of Wood Anatomists) to inform;
- Make a market analysis to know for example who will be the users of the methods and their expectations;
- Promotion of the methods by organizing side events during conferences,
- Promote sampling during national forest inventories organized by FAO.

COMMUNICATION STRATEGY

- There is a need to develop a **communication strategy** to attract potential funding to advance the aims of the Network and address potential misunderstanding or concerns
- Approaching agencies implementing the Lacey act, the EU timber regulation, the Australian Illegal Logging Bills, etc. to learn about their requests;
- Reaching out to the private sector, forest concessionaires conducting logging activities in the field;
- Combining our efforts with other networks and organizations promoting tools to fight illegal logging.

STANDARDS

Standards have to be elaborated and agreed on for different aspects including sampling, DNA isolation from wood, barcoding, genotyping, data analysis etc.

PROTOCOLS FOR SAMPLING

- Need to provide guidelines for sampling reference material for species identification

- We might need different protocols for sampling a) at the country scale, b) for regions within a country, c) Chain-of-custody approach, and d) for species identification by DNA barcoding.

RING TESTS

- Not necessary for stable isotopes,
- For DNA, the test should be done with accredited labs supplying data for the database
- For some molecular markers (nuclear and chloroplast microsatellites), it is important to develop allelic ladders as standards or even sequence all alleles,
- Workshops on data analysis would be useful to ensure that proper analyses and interpretations of results.

ACCREDITATION SYSTEM FOR PUBLIC AND PRIVATE LABS

Biodiversity will coordinate a formal accreditation system later. All labs involved in the development of the database should be involved in the ring tests.

FUNDRAISING

There is a need to raise additional money to finance activities such as the ring and blind tests as well as expanding the database to other species. Sampling is a major challenges requiring funding especially in developing countries.

**PERSPECTIVES
FROM VARIOUS
STAKEHOLDERS**

PERSPECTIVES FROM CERTIFIERS, PRIVATE ENTERPRISES AND INTERNATIONAL ORGANIZATIONS

Panel: Sarah Price (PEFC), Phil Guillery (FSC), Darren Thomas (DoubleHelix), Adam Grant (WRI), Agus Adrianto (CIFOR)

Moderator: Oudara Souvannavong (FAO)

What are your expectations from this project?

- Great to see how far we've got with fingerprinting techniques. There is still a lot of skepticism of what scientific approaches can do for timber tracking. However, in the last 3 years there has been a notable change and now international institutions like Bioversity are taking up the coordination of the project. A lot of work is being done by individuals, and groups but we are all working towards the same goal. That makes it much easier for companies like DoubleHelix to provide services. A great increase in practical application of the tools can be expected in the next couple of years. (Darren Thomas)
- Timber laundering is one of the biggest issues in illegal logging. We expect that fingerprinting techniques can help to reduce illegal logging. (Agus Adrianto)
- PEFC international expectations for the project and why we are engaged in it is that the technologies have a big potential and can be applied in industrial scale. We can make the link between science and the private sector as we have 10,000 companies in our chain-of-custody (CoC) system. We are concerned about the cost of the technology, but we are also looking at the geographical scope and if enough data is already available to provide additional supports for our CoC system. The system seems not to be bullet proof yet and needs to be strengthened by collaboration. (Sarah Price)
- FSC has similar views as PEFC. Some time ago, CoC was considered impossible, now it is accepted. Now the same thing may be happening with fingerprinting. Having the price coming down is important, and fingerprint testing may become a routine part of the CoC. We hope to have data on wood product sources so that CoC can be enhanced and made more robust while supporting certification. (Phil Guillery)
- WRI has been working on issues regarding the illegality of forest and forest products in support of the Lacey Act. When we started back in 2008 there was a discussion about how the private sector can control the supply chain and paper-based certification. Over the last two years technologies such as DNA are developing. We are expecting and hoping that this initiative can support the development of DNA. There is interest in the private sector that technologies can be used as a tool to do due care, and for governmental agencies for control. What we've heard so far is that DNA won't work, but with what's happening now with Bioversity creating this database, we are creating the foundation for the application of such techniques. (Adam Grant)

- As UN Agency for Food and Agriculture (including Fisheries and Forestry), FAO collects and makes available information on forests including data on forest resources and technical information to facilitate policy making and implementation. FAO acts as a neutral forum for discussion of issues related to policies. FAO also provides technical assistance to policy development and implementation, including FLEGT. FAO collaborates with EU-ACP to assist member countries in FLEGT. FAO is very interested in the development of the tools and technologies that can help enforcement of timber regulations, and to facilitate upscaling of their use at a later stage. Finally, this project will produce knowledge and information on genetic diversity of important timber species are useful for timber tracking but also for a better design and implementation of programs aiming at conservation and sustainable use of genetic resources of these species. (Oudara Souvannavong)

What will be the contribution or participation of your institution to this project?

- WRI is putting in together a project in support of the private sector and governments to apply new regulations. We are bringing together groups, private sectors, NGOs and governments, which we are doing through the Forest Legality Alliance. Through this, we are creating processes for analyzing best practices in supply chain. We are looking at how other regions in the world are implementing laws, we are putting together tools for analysis of laws by country with analysis of the trade of species, putting online database around tools and laws for forest management and for species management, harvesting, identification and uses. A part of this work is trying to identify new tools and technologies. We need to better network and try to secure funding. So we've already looking for funding for initiatives like this of Bioversity. We're also looking to help the service providers to go out, look for new species, collect data and start mapping the use of DNA through individual projects. WRI is quite committed with networks and we are ready to help, to do more outreach and explain to people what this project is trying to do. Hopefully, if our proposal is successful, we would like to partner with Bioversity. (Adam Grant)
- FSC is a not-for-profit organization dedicated to the promotion of responsible forest management worldwide. Members of FSC's economic, social and ecological chambers represent a wide network of stakeholders. FSC is involved in more than 100 countries and auditors make regular visits to forests all over the World. Making the sampling as part of the CoC system is something we can explore. (Phil Guillery)
- PEFC is a network of associations with members from public and private sectors across the world. We also want practical approach, and perhaps sampling can be done through our members at the national level. PEFC International is a standard setting organization, and within a certification scheme, there are different roles and responsibilities. Companies and private sectors are the one implementing those standards. But the standards have to be certified by certification bodies (e.g. SGS, Rainforest Alliance): they are the ones going out to do the checking and they are potential partners in the process. There is not much PEFC international would do in term of direct checking; otherwise we will have a conflict of interest because of the independence between all of the components of the certification scheme. But we are very much interested in knowing how

it can play within our system but it wouldn't be necessary PEFC international who will be playing direct role and doing spot check. (Sarah Price)

- CIFOR has no mandate to conduct molecular researches. Data created by the project on species distribution and forest degradation would be of interest for us. (Agus Adrianto)
- Main contribution in on the promotion of the technologies to various markets. It's in our interest to generate acceptance and get adoption by industry, development agencies and certification systems. Then we can get more involvement from the private sector. For the moment most of the work is done through public money but time will come soon with more involvement from the private sector with trade of wood products. We are looking to promote, as much as we can. (Darren Thomas)
- FAO would help in improving information and awareness of the new tools and their interest in implementation of policies and agreements, among concerned government authorities. How to integrate sampling during forest inventories is another area where FAO could help on. (Oudara Souvannavong)

Which are the specific aspects or issues that need particular attention?

- How do we encourage the involvement of as many people and countries as possible to have full coverage of forest resources worldwide? The project will develop a central database that everyone can access and utilize (Darren Thomas)
- The project will also affect small and medium size timber companies and we need to think more about their implications as well (Agus Adrianto)
- Getting as many species from different geographical regions as possible into the database so that we can have a critical mass of information to be incorporated or used by the industry. People who are already certified and have CoC are not generally involved in illegal trade. It may be easier to collaborate on CoC approaches with them than with non-certified companies. Also it is important to develop more expertise, more practitioners and make the methods less scientific (Sarah Price)
- Getting information on origin of traded and endangered species the right species, involve the private sector, NGOs; and outreach through governments would facilitate progress (Phil Guillery)
- Things are moving very fast with changes in laws, basic practices, and processes. We are doing the right things and it is important to stay relevant and move quickly. Make sure we have the right species with the right information; and make sure it's relevant geographically and cover all regions of the World is important. The use is very important so try to understand what is useful as driving of the process. Finally the database should be open access to everyone (Adam Grant)
- It is not easy to get a new tool and policy in place. All panelists highlighted the need for networking, involving private sector, NGOs and governments (Oudara Souvannavong)

Discussion

- FSC has many offices all over the World. How can they start talking about the project through their offices in countries where they are represented? In case it's difficult to get the government involved, perhaps FSC can provide alternatives way for stressing the

importance of fingerprinting to ensure market access and benefit conservation (Milton Kanashiro)

- A very good point, FSC has over 40 offices across the world. Plan for 2012 is to look at quality control, timber tracking and stable isotopes at the national offices (Phil Guillery)
- PEFC is also present in many countries around the World and can also promote the methods through that network (Sarah Price)
- Small scale loggers, community forests are logging and some of it is not licensed. There are concerns about communities being punished by a crack-down on illegal logging that does not take into consideration their situation and traditional rights. CIFOR has done some work on that area and we could collaborate with them as well. (Judy Loo)

PERSPECTIVES FROM PRODUCER AND CONSUMER COUNTRIES

Panel: Rahman B. Hj. Abd. Rahim, (Forestry Department Peninsular Malaysia), Yin Yafang (CAF), Thorsten Hinrichs (BMVEL), Gerhard Breulmann (ITTO), Milton Kanashiro (EMBRAPA)

Moderator: Sim Heok-Choh (APAFRI)

How applicable are the new tools in controlling illegal logging and improving transparency?

- In recent years, corporations such as the one between the Chinese forest state administrations and the Chinese customs are trying to control illegal logging and timber imported to China. Sometimes, government agencies provide to us wood samples for species identification and the determination of the CITES status (Appendix). But quite often it's very difficult for us to identify them with wood anatomy techniques. We are able to provide sometimes a certificate of identification only at the Genus level. If DNA can help overcome the species identification problem, it will be very useful for us. They are many research institutes in China working with molecular and isotope techniques that would be interested in being involved (Yin Yafang)
- A project to evaluate the genetic impact of logging (Dendrogene) was conducted in Brazil. There was a strong reaction from private companies who thought that our goal was to stop logging. It's a very sensitive issue in developing countries; and if the objectives are not well-explained, they will be a lot of misunderstandings. Every time genetic information will be put into a database, it's a problem. The Convention on Biological Diversity (CBD) has created some problems and confusions on what is genetic information. It put scientists in difficult situation to conduct field work, to sample materials while explaining the uses to the population. There is a need to clarify the importance of the methods, it is sensitive to discuss but can be accepted if there no genetic resources involved. Stable isotopes might be accepted more easily than DNA. There was an effort in Brazil to have all forest management plans certified by 2005. But there was a lot of resistance from forest companies. But with the creation of the Brazil Forest Service, and the move to forest concessions, with new regulations, it seems like the certification rate has decreased in Brazil though FSC has been there for 15 years. FSC or other groups doing similar work can play an important role in the process in Brazil because they are also promoting forest management and conservation. Reduced impact logging (RIL) is good but not enough in terms of biological processes because many species have low density and many are not well or cannot be identified (Milton Kanashiro)
- Methods are suitable and adapted for the control of timber sources and they will play a bigger role in the future. It is important to have something ready to be used in the next 3 years. In the near future the project should contribute considerably to reduce illegal logging. Regional workshops are also planned in Africa and Americas and should result in the creation of regional networks. It is important to explain the use of the data. However, there shouldn't be any issue with CBD regulations because we are not collecting genetic

resources to develop or create medicine or new products. Promoting sustainable forestry is also about promoting conservation. Timber traders have complained that their business is being made more difficult. However, the applications can actually help to use tropical forest sustainability because legality can be proven and because the forest can be used and saved from conversion to other land uses. Many people advocate a ban on tropical timber fearing that they are from illegal sources. (Thorsten Hinrichs)

- This is a significant project bringing new thinking and new tools to further enhance the existing timber tracking systems. Both consumers and producers should be equally responsible for timber legality because the timber is not traded as logs today but as wood products (processed timber) and are therefore difficult to identify. DNA and stable isotopes are really needed to trace the processed timber. But we need proper equipment or tools that can detect quickly because wood products travel very fast. I'm sure the tools are expensive and consumers need to bear the cost. One must not transfer the cost of such new tools to the producers because with tropical forest having so many species, we can imagine the size of the database, and it must be secured. Anyhow the tools are a good complement to existing methods. Forestry Department in Peninsular Malaysia is now attempting to use RFID (electronic tags) but it is attached to the wood and can be manipulated while DNA and isotopes cannot be manipulated. More research and development can help enhance forest management. The methods can also contribute to forensics and enhance transparency. (Rahman B. Hj. Abd. Rahim)
- The International Tropical Timber Organization (ITTO) objective is to promote sustainable forest conservation, management, use and trade of tropical timber. In the context of reduced illegal logging, they have been numerous activities implemented over the last 25 years. That includes a variety of projects on the ground with different stakeholder groups (government, communities etc.), including trainings, certification and CoC related, etc. DNA and stable isotopes are very new for ITTO as well, and there has not been much involvement from us in the past. One of ITTO's thematic programmes called TFLET (Forest Law Enforcement, Governance and Trade) explicit objective is to seek proposals for innovative new technologies on timber tracking; and this project is in line with the TFLET. The TFLET programme has been developed not in the secretariat but by the nearly 60 member's countries. ITTO represents 80% of tropical timber production and 90% of trade. Despite the technical difficulties, we see the new tools as productive, not as something imposed on producer countries to comply with traditional requirements. They are rather supportive tools for more transparency and the improvement of the image of tropical timber. (Gerhard Breulmann)

In what way do you think your countries can adopt and adapt the new tools into policies, laws and practices? Are the countries willing to contribute to the implementation (sampling, building-up database and setting up international standards) of the project?

- I'm a member of the committee on public forests and I can bring this issue to the table and explain the usefulness of the tools to members of the committee, hopefully it will be taken well and promoted (Milton Kanashiro)

- Germany is willing to adopt it. More broadly, European countries are very busy drafting guidelines for operators, control authorities, information tools for operators to use to put timber on the market. Once the tools will be ready for use (hopefully in three years time) all other European countries will adopt it. (Thorsten Hinrichs)
- The use of the new tools is voluntary as it is driven by consumer demand. Malaysia was involved in certification with the expectation of getting in return a better price through better image. However after engagement, sometimes little benefit has been realized while practices have already been changed and costs incurred. Therefore the new tools will be used if consumers are willing to pay better price to cover the costs associated. Otherwise it will be difficult to implement. (Rahman B. Hj. Abd. Rahim)
- China is willing to contribute to such initiatives. The research community should develop the technologies further and distribute them to the forest and wood industries particularly. Policy makers also need to be involved. It will take lot of time to build such tracking system in China because the country is large with an uneven economic development. Tracking system can really increased production cost for the wood industry. We need also to address that and what will be the benefit for the industry. China very much interested in developing a real and strong international cooperation. (Yin Yafang)
- ITTO will support and monitor progress of the project in Africa. We can also promote and raise awareness during our council meetings for example. We can provide information on species selection by giving statistics on trade, volumes by species, etc. We also have networks established at a different level that might be useful for the project. ITTO may also be able to provide funding opportunities for satellite projects either under the thematic programmes or the regular funding scheme. (Gerhard Breulmann)

Discussion

- Do you think that the regulations are influencing the interest in reaching sustainability or do you see it differently? (Johannes Zahnen)
 - Certification process helps countries to understand that when products are certified, they can reach different markets and they were also expecting better price. That's why a lot of companies decided to certify their products. But once they had the certified products, they didn't get the expected economic benefit. But the process was very important in improving timber production. Sustainable forest management itself is a big concept. One difficult thing to apply it is the monitoring especially related to biological aspects (e.g. FSC principle 6). If we are able to have genetic data for species identification, sustainable forest management will improve (Milton Kanashiro)
- What price increase do you think the market can tolerate? (Bernd Degen)
 - Certification is voluntary, facilitates access to the market and is linked to sustainable forest management. Timber certification is different and requires the tracking of origin. If whatever costs associated can be compensated by the market, the system will be applied. It is the responsibility is both consumer and

producer countries to find the solution to stop illegal logging (Rahman B. Hj. Abd. Rahim)

- There is an expectation that everyone would be willing to contribute actively to the project. Bioversity cannot do everything alone; they need our contributions to ensure the success of project. (Thorsten Hinrichs)

CONCLUSION AND CLOSING

In her closing remarks, **Judy Loo** thanked all participants for their enthusiasm and active participation to the workshop, the excellent presentations with practical examples on uses and the latest policy developments. She stressed also the important discussions and input from all participants on the database, the foundation of the GTTN network and to overcome the challenges ahead.

Finally she explained that the next steps (after the meeting of the steering committee) will be to set up the website, elaborate the framework of the database, draft the data sharing agreement and start organizing the regional workshops.

ANNEXES

Annex 1: Inception workshop programme

Annex 2: List of participants

Annex 1: Inception Workshop Programme

Tuesday 24 April 2012		
08:15-09:00	Registration	
09:00-10:00	Workshop Opening	
10:00-10:30	Tea & coffee break	
10:30-10:40	Review of the meeting agenda	Marius Ekué
Session 1: Legal initiatives to fight illegal logging, Chair: Bernd Degen		
10:40-11:00	EU initiatives to fight illegal logging and the role of fingerprinting techniques	Thorsten Hinrichs
11:00-11:20	Overview and update of the US Government initiatives to fight illegal logging	Shelley Gardner
11:20-11:40	FLEGT activities in Asia	Aimi Lee Abdullah
11:40-12:00	Illegal logging and associated trade: perspectives from a global NGO	Johannes Zahnen
12:00-12:30	Q&A	
12:30-13:30	Lunch break	
Session 2: DNA based technologies for wood & wood product verification, Chair: Norwati Muhammad		
13:30-13:50	DNA timber tracking: opportunities and challenges	Andrew Lowe
13:50-14:10	Practical applications of DNA technologies in timber identification and tracking	Bernd Degen
14:10-14:30	DNA profiling databases to verify the legality of suspected timbers	Soon Leong Lee
14:30-14:50	Molecular database for classifying <i>Shorea</i> species	Yoshihiko Tsumura
14:50-15:10	Reference-free analysis of genomic data using a case study of ramin, plus some thoughts on prioritizing species selection	Charles Cannon
15:10-15:50	Q&A	
15:50-16:20	Tea & coffee break	
Session 3: Stable isotope based technologies for wood & wood product verification, Chair: Wickneswari Ratnam		
16:20-16:40	Practical applications of stable isotope technologies for timber tracking	Markus Boner
16:40-17:00	Tracing the Origin of Food (TRACE) - International projects on verifying origin of foods	Simon Kelly
17:00-17:20	Stable isotope reference materials at IEAE: proposed woods RMs	Manfred Groening
17:20-18:00	Q&A	
19:45	Workshop dinner	
Wednesday 25 April 2012		
Session 4: Brainstorming and project planning, Chair: Judy Loo		
08:30-08:50	Project overview and key issues to address	Marius Ekué
08:50-09:20	General discussion	
09:20-10:00	Group work, Chairs: Judy Loo & Bernd Degen Two parallel groups will address the following themes (non-exclusive): <ol style="list-style-type: none"> 1. Online database with geo-referenced data on genetic structure and stable isotopes 2. Networking among contributing experts and institutes 3. Contribution to the Standards (sampling design, sampling size, genotyping methods, stable isotope techniques, data analysis etc.) 	
10:00-10:30	Tea & coffee break	
10:30-12:30	Group work (<i>continued</i>)	
12:30-13:30	Lunch break	
13:30-14:10	Group reports	
14:10-14:40	Discussion	
Session 5: Perspectives from certifiers, private enterprises and international organizations, Chair: Oudara Souvannavong		
14:40-16:00	Panel: Sarah Price, Phil Guillery, Darren Thomas, Adam Grant, Agus Andrianto	
16:00-16:30	Tea & coffee break	
Session 6: Perspectives from producer and consumer countries, Chair: Heok Choh Sim		
16:30-17:50	Panel: Rahman B. Hj. Abd. Rahim, Milton Kanashiro, Yin Yafang, Thorsten Hinrichs, Gerhard Breulmann	
17:50-18:10	Conclusion and Closing	

Annex 2: List of participants

Abdul Rahman Rahim

Director General
Forestry Department Peninsular Malaysia
Malaysia
Email: drarar@forestry.gov.my

Adam Grant

Senior Associate, Forest Legality Project Manager
World Resources Institute
USA
Email: agrant@wri.org

Agus Andrianto

Research Assistant, Forests and Governance
Programme
Center for International Forestry Research (CIFOR)
Indonesia
Email: a.andrianto@cgiar.org

Aimi Lee Abdullah

Policy Analyst
European Forest Institute (EFI)'s
Forest Law Enforcement, Governance & Trade (FLEGT)
Asia Regional Support Programme
Malaysia
Email: aimi.lee@efi.int

Andrew Lowe

Prof., Director Australian Centre for Evolutionary
Biology and Biodiversity
DoubleHelix
University of Adelaide
Australia
Email: andrew.lowe@adelaide.edu.au

Bernd Degen

Director Institute of Forest Genetics,
Johann Heinrich von Thünen-Institut (vTI)
Germany
Email: bernd.degen@vti.bund.de

Chai Ting Lee

Forest Biotechnology Division,
Forest Research Institute Malaysia (FRIM)
Malaysia
Email: leechait@frim.gov.my

Changtragoon Suchitra

Head of Forest Genetics and Biotechnology Division ,
Forest and Plant Conservation Research Office;
Department of National Parks, Wildlife and Plant
Conservation
Thailand
Email: suchitra.changtragoon@gmail.com

Charles Cannon

Associate Prof., Department of Biology at Texas Tech
Univ.
Prof. Chinese Academy of Sciences
Texas Tech University
USA
Email: chuck.cannon@gmail.com

Chin Hong Ng

Forest Biotechnology Division,
Forest Research Institute Malaysia (FRIM)
Malaysia
Email: chinhong@frim.gov.my

Darren Thomas

Managing Director
Double Helix Tracking Technologies Pte Ltd
Singapore
Email: Darren@doublehelixtracking.com

Gerhard Breulmann

Planning, Monitoring and Evaluation Officer
International Tropical Timber Organization (ITTO)
Japan
Email: breulmann@itto.int

Heng Hau Yeo

Senior Director, Public & Corporate Affairs Division
Malaysian Timber Council
Malaysia
Email: yeo@mtc.com.my

Heok Choh Sim

Executive Secretary
Asia Pacific Association of Forestry Research Institution
(APAFRI)
Malaysia
Email: simhc@frim.gov.my

Iskandar Siregar

Prof., Director for Research and Strategic Issue Studies
Department of Silviculture, Faculty of Forestry,
Bogor Agricultural University (IPB)
Indonesia
Email: izsiregar@yahoo.com

James Josue

Programme Leader & Head – Sawmill and Wood
Technology Division
Utilization of Forest Products Programme
Forestry Department Sabah
Malaysia
Email: James.Josue@sabah.gov.my

Johannes Zahnen

Forest Policy / Business Cooperation
World Wildlife Fund (WWF)
Germany
Email: zahnen@wwf.de

Judy Loo

Senior Scientist, Theme Leader, Forest Genetic
Resources Programme
Bioversity International
Italy
Email: j.loo@cgiar.org

Khairunnisa Othman

Research Officer Research, Development & Innovation
Division,
Forest Department of Sarawak
Malaysia
Email: khairuno@sarawak.gov.my

Kwong Yan Choo

Programme Specialist
Bioversity International
Malaysia
Email: k.choo@cgiar.org

Latif Mohmod

Director General
Forest Research Institute Malaysia (FRIM)
Malaysia
Email: latif@frim.gov.my

Lay Thong Hong

Honorary Research Fellow
Bioversity International
Malaysia
Email: l.hong@cgiar.org

Lee Hong Tnah

Forest Biotechnology Division
Forest Research Institute Malaysia (FRIM)
Malaysia
Email: leehong@frim.gov.my

Leocadio Sebastian

Regional Director Asia the Pacific and Oceania
Bioversity International
Malaysia
Email: l.sebastian@cgiar.org

Manfred Groening

Reference Materials Specialist, Terrestrial Environment
Laboratory
International Atomic Energy Agency (IAEA)
Austria
Email: m.groening@iaea.org

Marius R.M. Ekué

Scientific Coordinator, Identification of Tree Species
and Geographic Origin
Bioversity International
Malaysia
Email: m.ekue@cgiar.org

Markus Boner

Managing Director
TÜV Rheinland, Agroisolab
Germany
Email: m.boner@agroisolab.de

Mei Jiun Kwek

Scientific Assistant
Crops for the Future
Malaysia
Email: m.kwek@cropsforthefuture.org

Milton Kanashiro

Embrapa Eastern Amazon
Brazilian Agricultural Research Corporation (EMBRAPA)
Brazil
Email: milton.kanashiro@embrapa.br

Nasir bin Abu Hassan

Director of Silviculture & Forest Biodiversity
Conservation
Forestry Department of Peninsular Malaysia
Malaysia
Email: hjnasir@forestry.gov.my

Norwati Muhammad

Director Forest Biotechnology Division
Forest Research Institute Malaysia (FRIM)
Malaysia
Email: norwati@frim.gov.my

Oudara Souvannavong

Forestry Department
Food and Agriculture Organization of the United
Nations (FAO)
Italy
Email: Oudara.Souvannavong@fao.org

Phil Guillery

Systems Integrity Director
Forest Stewardship Council (FSC)
USA
Email: p.guillery@fsc.org

Rachel Riviera

Freelance journalist, Blogger
Center for International Forestry Research (CIFOR)
Indonesia
Email: racriv@mac.com

Reiner Finkeldey

Prof., Head of Section, Forest Genetics and Forest Tree
Breeding
Georg-August University of Göttingen
Germany
Email: rfinkel@gwdg.de

Riina Jalonen

Associate Expert, Forest Genetic Resources
Bioversity International
Malaysia
Email: r.jalonen@cgiar.org

Sapto Indrioko

Forest Genetics, Faculty of Forestry,
Galah Mada University
Indonesia
Email: saptoindrioko@yahoo.com

Sarah Price

Head of Projects & Development
Programme for the Endorsement of Forest Certification
(PEFC)
Switzerland
Email: sarah.price@pefc.org

Shelley Gardner

Illegal Logging Program Coordinator
United States Department of Agriculture (USDA)
USA
Email: shelleygardner@fs.fed.us

Shamn Cheng

Tropical Forest Biodiversity Centre, Entomology
Section
Forest Research Institute Malaysia (FRIM)
Malaysia
Email: shawn@frim.gov.my

Simon Kelly

Research leader, Stable Isotope Ecology and Forensics
The Food and Environment Research Agency, Sand
Hutton, York
UK
Email: Simon.Kelly@fera.gsi.gov.uk

Soon Leong Lee

Head of Genetics Laboratory
Forest Research Institute Malaysia (FRIM)
Malaysia
Email: leesl@frim.gov.my

Teng Kew Khoo

Scientific Assistant – Project Development
Crops for the Future
Malaysia
Email: t.khoo@cropsforthefuture.org

Thorsten Hinrichs

Deputy Head of Division, European and International
Forest Policy
Federal Ministry of Food, Agriculture and Consumer
Protection (BMELV)
Germany
Email: Thorsten.Hinrichs@bmelv.bund.de

Wickneswari Ratnam

Prof., Head of Research Cluster on Genomics and
Systems Biology
School of Environmental and Natural Resource Sciences
University Kebangsaan Malaysia
Malaysia
Email: wicki@ukm.my

Yin Yafang

Prof., Chief Department of Wood Anatomy and
Utilization,
Research Institute of Wood Industry
Chinese Academy of Forestry
China
Email: yafang@caf.ac.cn

Yoshihiko Tsumura

Director, Department of Forest Genetics,
Forestry and Forest Products Research Institute
University of Tsukuba
Japan
Email: ytsumu@ffpri.affrc.go.jp



Participants at the opening session (Photo: Yusni Idris, FRIM)

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