Bamboo Carbon Potential for Mitigating Climate Changes – *An Introduction to Afforestation Methodology for Bamboo Carbon Projects*

Dr. Lou Yiping, Consultant on Bamboo projects to INBAR

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Team on the bamboo afforesation carbon accounting and monitoring methodology development, 2012-2014

Team leader: Dr. Lou Yiping
Team member:
Dr. Yannick Kuehl, former project officer, now TRAFFIC-Asia
Ms. Li Yanxia, Programme officer at INBAR
Dr. Li Jinliang, China Green Carbon Foundation
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Questions to answer:

1.What are features and capacity of bamboo for carbon capture?

2.How to account and monitor the additional carbon and create carbon credits for marketing?

Outline

- **Background: feature and capacity of bamboo for carbon capture**

- Pilot projects and the bamboo afforestation methodology for carbon projects

- Future development
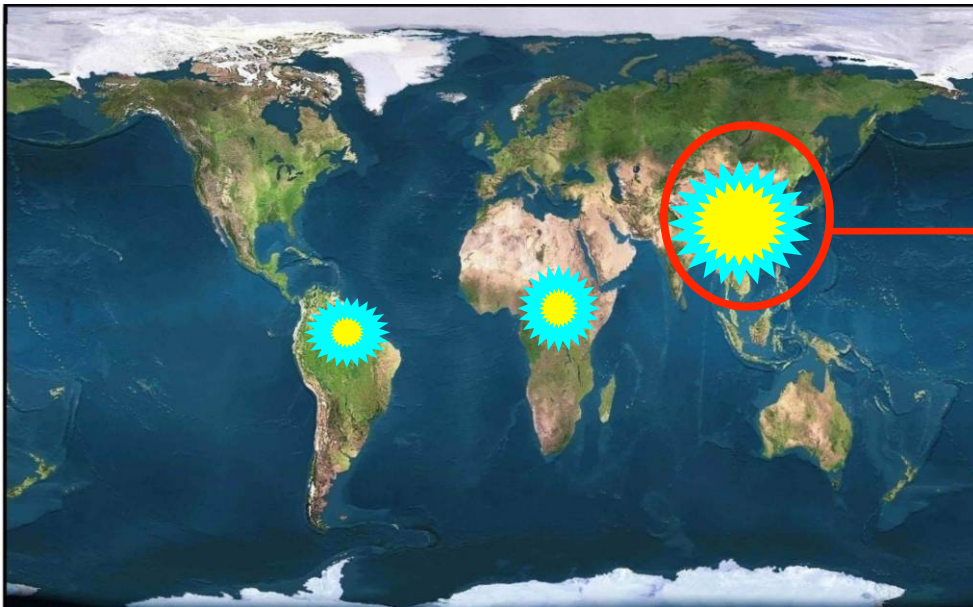
Botanically, bamboo is a grass …and not a tree!

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Bamboo Resources in the World

- About 1,200 species worldwide.

- Bamboo forests cover 32 million ha, accounting for 2% of total forest area.

- Three main bamboo forest regions: Asia-pacific region, Americas, Africa.

bamboo for durable projects

- Widely used for plywood, flooring, furniture, arts and crafts, etc.
- More than 2,000 bamboo products.

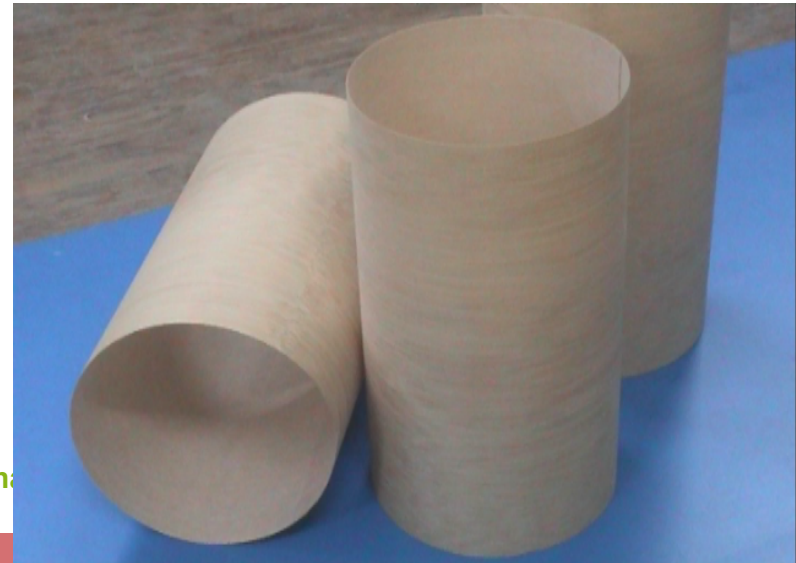Wood-bamboo laminated veneer lumber

veneer-faced decorative board

Bamboo Furniture

Bamboo Boards

Bamboo and Climate Change

- Culm-rhizome system → allows simultaneous biomass extraction & carbon storage
- Ecosystem survives decades, but individual culms die after around 10 years
- Grows in the tropics and subtropics – part of multi-purpose forests (agro-forestry)
- Many ways of utilizing bamboo, some for durable products

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Bamboo and Climate Change

Bamboo: Highly Renewable!

↑

Bamboo is one of the *fastest growing*, *most renewable* forest/plant resource in the world:

- ➢ Grows up to 20-30 m high and maximum 1.0 meter/day
- ➢ reaches final height/diameter within only 2-4 months

Ecosystem of the survives decades → *requires management*

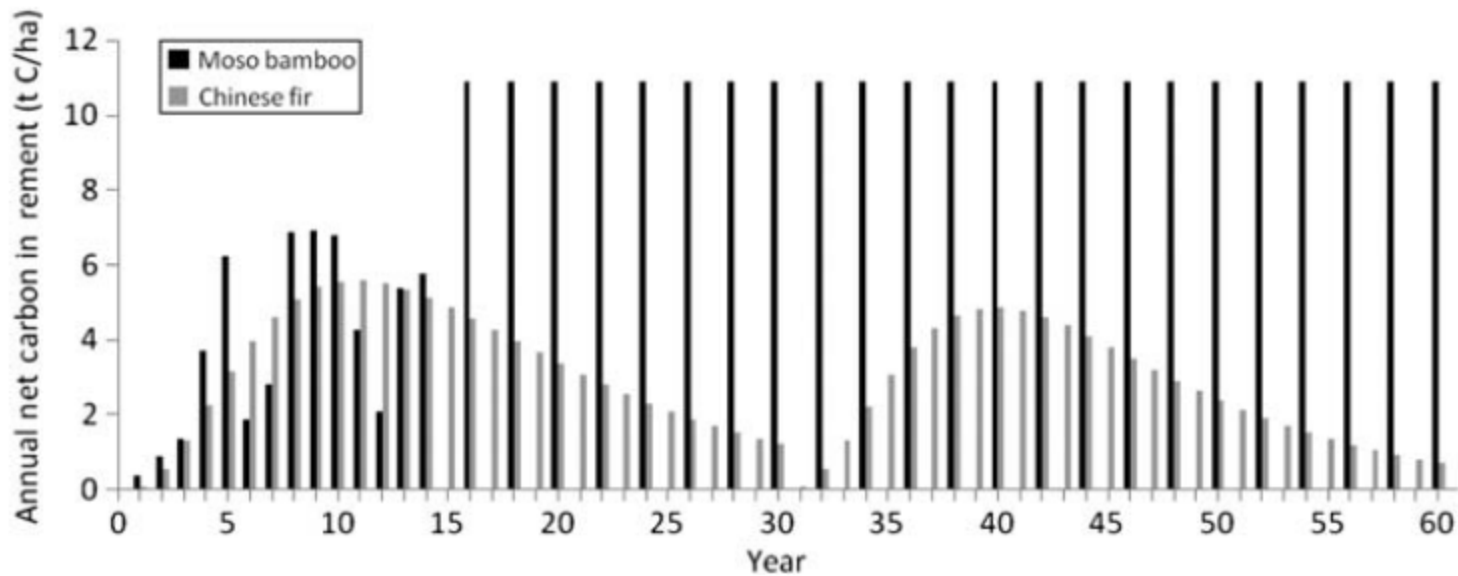**INBAR Study: Carbon Sequestration in a Managed Stand**

Figure 2. Comparison of modelled annual carbon stock increment of newly established Moso bamboo – regular-harvest scenario – and Chinese fir plantations.

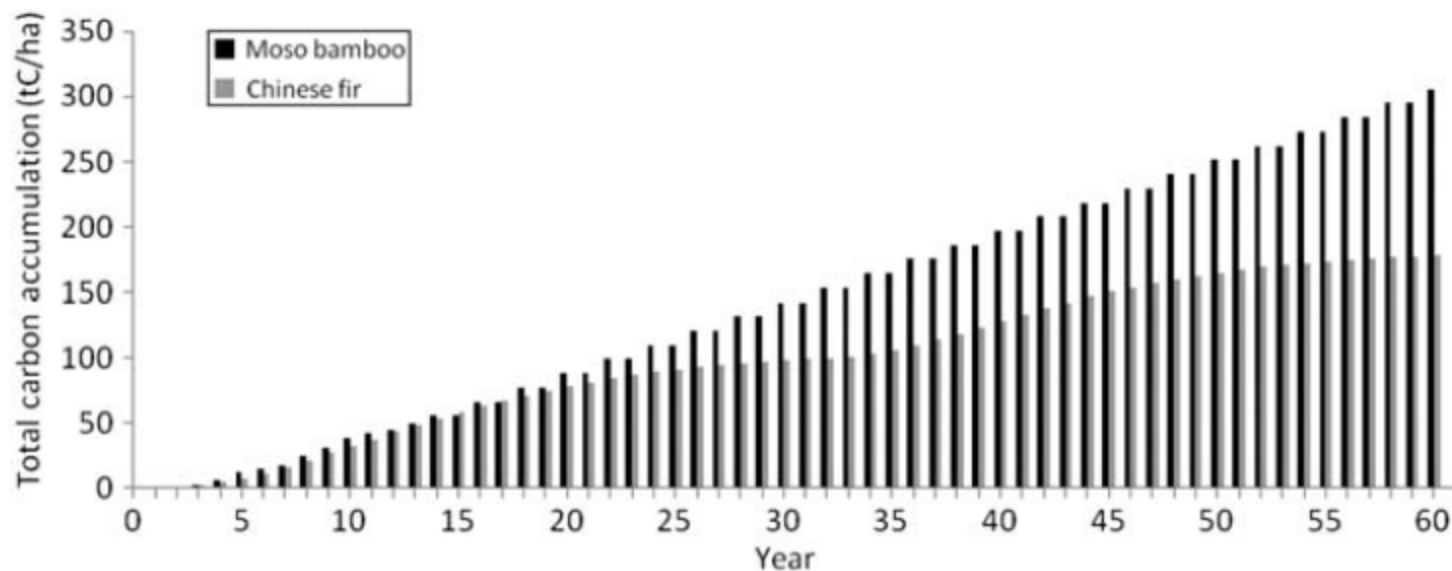**The International Network for Bamboo and Rattan**

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Figure 3. Patterns of modelled aggregated carbon accumulation of newly established Moso bamboo – regular-harvest scenario – and Chinese fir plantations within 60 years.
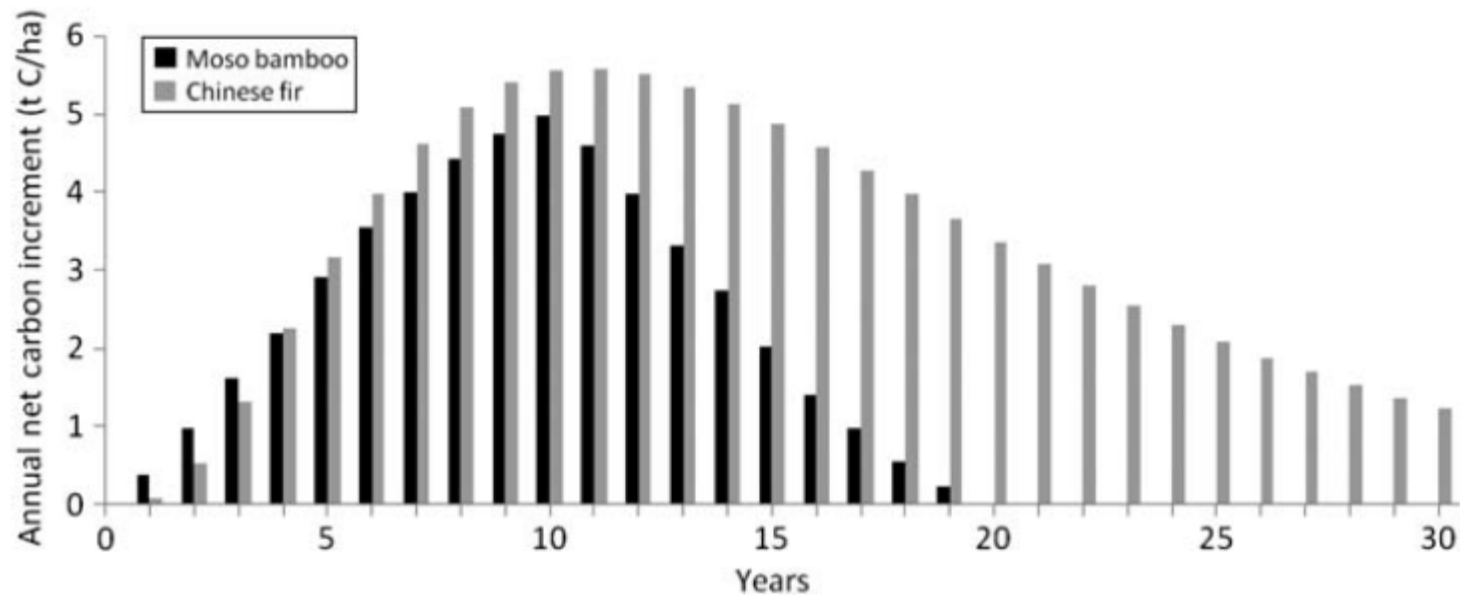
Figure 4. Comparison of modelled annual carbon sequestration patterns of newly established Moso bamboo – no-harvest scenario – and Chinese fir plantations.
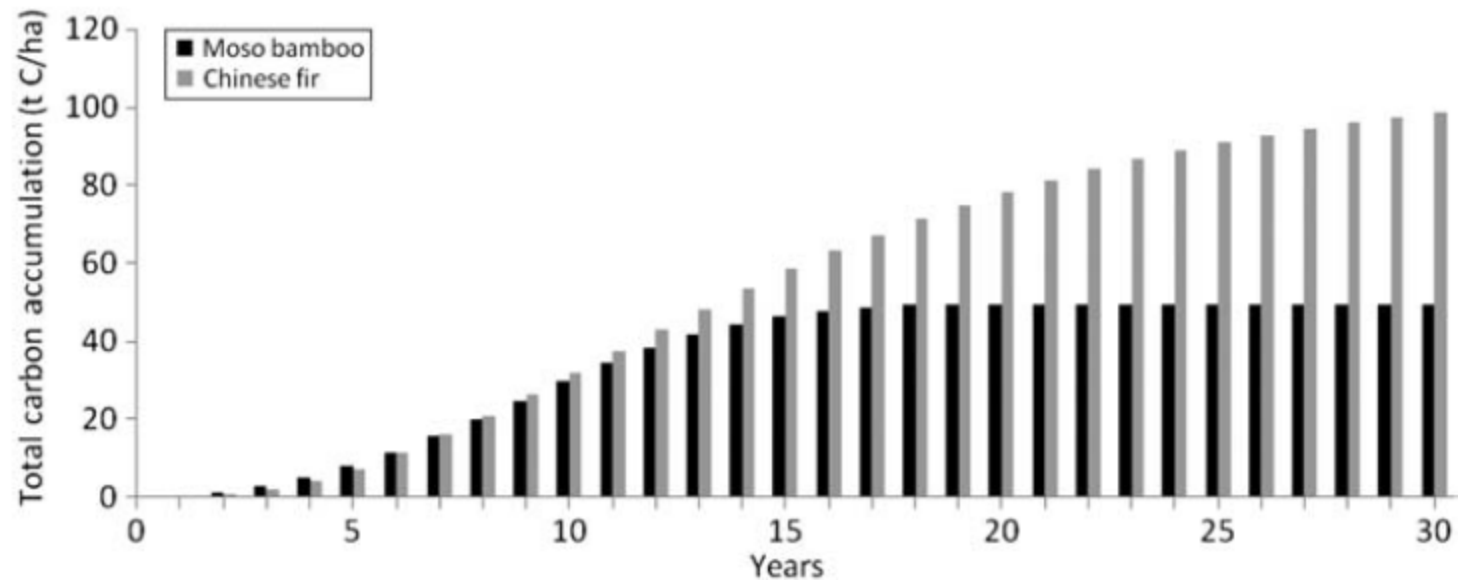
Figure 5.   Patterns of modelled aggregated carbon accumulation of newly established Moso bamboo – no-harvest scenario – and Chinese fir plantations.

Outline

- Background

- **Pilot projects and the bamboo afforestation methodology for carbon projects**

- Future work

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Carbon Accounting Methodology

- Global demand for bamboo specific carbon accounting methodologies for afforestation with bamboo
- Until recently: lack of bamboo-specific methodologies and approaches
- 2013: breakthrough – Carbon off-setting with bamboo is now possible → INBAR, CGCF and ZAFU: "Carbon accounting methodology for afforestation with bamboo in China" officially accepted and endorsed by SFA and Chinese government agencies!

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Meanwhile, Other initiatives on bamboo carbon afforestation methdologies have been developed, such as:

- VCS (Verified Carbon Standard),
- PandaStandard
- CDM Goldstandard

which reflect global demand

INBAR, CGCF and ZAFU Carbon Accounting Methodology

- Pilot and verification site for methodology: 46.7 ha of *Phyllostachys pubescens* planted in Lin'an, China
- Chinese company (Alibaba) have bought 8,155 t CO_2e (voluntary market)
- Bamboo-specific carbon accounting methodologies: early stage → further development (research and practice)

INBAR, CGCF and ZAFU Carbon Accounting Methodology

Expansion to other INBAR member countries and inclusion of more species through Pilot & Verification phase

- Test & adapt a global carbon accounting methodology for afforestation with bamboo
- Implement methodology in respective countries
- Demonstrate possibilities

Potential sites in:

- Africa (Kenya, Ethiopia, etc.)
- Asia (China, Cambodia, Vietnam, etc.)

Brief Introduction to the Carbon Accounting Methodology for Bamboo Afforestation in China

■ The methodology was issued by State Forestry Administration of P.R. China, in November 2013.
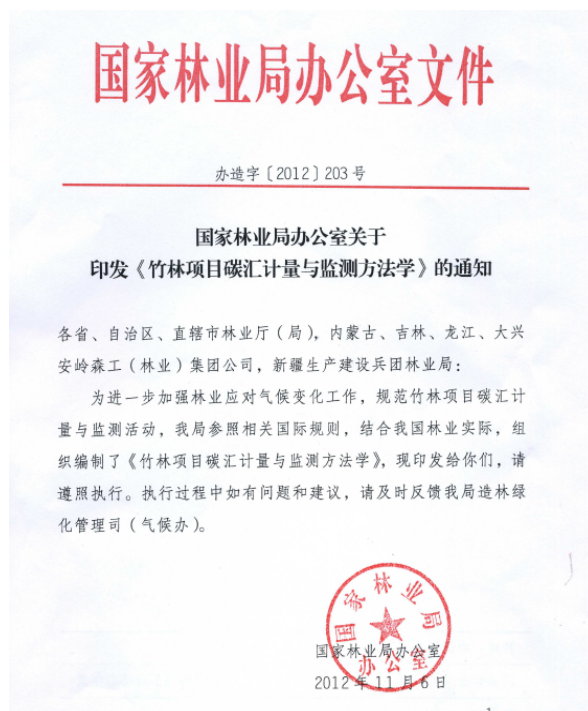
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Principles of the Methodology Development

- Comprehensive benefits from proposed project scenario: better than the baseline scenario

- Improving eco-environment and protecting biodiversity

- Building a vigorous and sustainable development of local communities.

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Scope **and applicability conditions**

■ Scope

This methodology is applicable to all potential bamboo afforestation projects for certificated emission reductions.

■ applicability conditions

➢ Land used for projects shall be non-forested, and not previously designated forest land

➢ The soil conditions, water availability and air temperature of the project lands should be suitable for bamboo growth

➢ The leaves and other litter shall not be removed from the ecosystem

➢ The net carbon stock has to be higher than that of the baseline

➢ The project scenario should provide at least the same level of comprehensive environmental benefits and effectiveness as that of the baseline

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Main definitions

- Bamboo forests:

  a) a minimum area equal to at least 0.067 ha,

  b) canopy cover of at least 20%

  c) DBH of the bamboo stem at least 2 cm (when matured)

- **5 Types of Bamboo plantations:**

  - Large/small diameter monopodial bamboo stands;

  - Large/small diameter sympodial bamboo stands;

  - Mixed amphipodial bamboo stand.

Identification of the baseline scenario and demonstration of additionality

The baseline scenario of **small-scale carbon projects** (CER_S/year≤16 000 t): continuation of the pre-project land use (demonstrations of additionnality need to be carried out)

For large-scale projects (CER_S/year >16 000 t): "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities"

Baseline net GHG removals by sinks

- Based on the methodology applicability:
    - The change of AGB and BGB for non-timber vegetation is zero;
    - The change of litter biomass is zero;
    - The change of soil organic carbon is zero
    - The baseline net GHG removals by sinks is: change of AGB and BGB of the forest trees

Project scenario

- Project c**arbon stock changes:** equal to the carbon stock changes of bamboo plantation biomass (AGB & BGB) minus carbon stock decrease of original vegetation biomass caused by the project.
- **The project GHG emissions:** GHG sources: Burning of woody biomass (CH_4 and N_2O)
- **Net anthropogenic GHG removals by sinks:** the change of the project carbon stock minus the increased GHG emission from the project, and minus the Baseline net GHG removals by sinks

Monitoring Procedure

- Monitoring plan
- Monitoring of project implementation
- Sampling design and stratification
- Precision requirements
- The relative error of the mean for estimation of bamboo biomass is 10% at 95% confidence level.
- Data requirements under the methodology

Appendix 1. Bamboo Afforestation Techniques for Carbon Project

- **Site preparation and clearing:** selective cultivation and selective shallow tilling shall be performed; large scale burning slash is not allowed. Scattered standing trees, shrubs and bamboo clumps should remain on the project site.
- **Species (seedling) selection and treatment:** select high quality native bamboo species **or either** d**omesticated** or planted **exotic species.**
- **Planting techniques:** different bamboo species needs to maintain reasonable rhizome length and branches for planting materials; no chemical fertilizer application.
- **Protection** and tending **techniques:** using biological, integrated prevention measures to control forest pest and forest fire; minimize the impact on local biodiversity and ecological environment.

Outline

- Background

- Pilot projects and the bamboo afforestation methodology for carbon projects

- **Future work**

1. Developing bamboo carbon afforestation methodology into ISO standards.

2. Development of accounting and monitoring methodology for managing bamboo forests.

3. Development of accounting and monitoring methodology for durable bamboo products.

New work item proposal to ISO: Bamboo Afforestation Methodology for Carbon Projects

Scope:

- To provide the underlying principles and guidelines on the applied range, design, eligibility, forestation techniques, selection of carbon pools and GHG emission sources, leakage, Identification of the baseline scenario and demonstration of additionality ,and project monitoring plan for bamboo forestation carbon projects.

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Purpose and Justification

- Bamboo is one of the fast-growing plants in the world and performs exceptional in carbon sink and income generation for rural communities according to studies and practices (e.g. in China, Ethiopia, Ecuador, India, Philippines and Vietnam).

- Other bamboo characteristics complement trees qualities (broad distribution, short rotations, low capital and high labor intensity, attractive economic returns, persisting belowground carbon stores, high efficiency of conversion to commercial products and relatively low investment risk).

- Bamboo grows and is widely planted globally for its significant environmental and economic values.

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Purpose and Justification

- Bamboos appear particularly suitable to small-scale forestation carbon projects ➔ near perfect match of bamboo to the goals of global environmental sustainability (mainly poverty reduction and combating climate change).

Purpose and Justification

Conclusion: "Bamboo Afforestation Methodology for Carbon Projects" aims to:

- be relevant both to the current international situation and common Chinese practices

- meet principles of scientific rationality and easy operability and requirements of the carbon market

➜ allowing stakeholders to develop bamboo afforestation carbon projects ➜ contribution to environmental sustainability, climate change and poverty reduction

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New work item proposal

- Draft document will be registered as new project in the committee's work programme (Stage 20.00)

- This is not a management system standard (MSS).

- Indication(s) of the preferred type to be produced under the proposal: International Standard

- Proposed development track: 2 (36months)

- Known patented items: No.

- A statement about NWIP:

List of relevant documents at the international, regional and national levels

- UNFCCC. A/R Large-scale methodology: Afforestation and reforestation of lands except wetlands. AR-ACM0003 / Version 01.0.0.

- UNFCCC. A/R Simplified baseline and monitoring methodology for small scale CDM afforestation and reforestation project activities implemented on lands other than wetlands. AR-AMS0007 / Version 02.0.0.1.

- International Network for Bamboo and Rattan. Methodology for Bamboo Forestation carbon projects, 2013 (Draft for final consultation), 2013.

- National Standardization Administration of P.R. China. GB/T 20391-2006, High-yield Management Techniques for Moso Bamboo Stands, 2006.

- State Forestry Administration of P.R. China. Guidance on Carbon Accounting and Monitoring for Forestation Projects, 2011.

- State Forestry Administration of P.R. China. Carbon Forestation Technical Regulations (trial implementation), 2010.

- State Forestry Administration of P.R. China. Methodology for Bamboo Forestation carbon projects, 2012.

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Potential benefiting stakeholders:

1. Bamboo plantation companies

2. Carbon management companies

3. Local and national governments

4. Small and medium sized enterprises which will use raw materials from the bamboo plantations.

5. Rural communities and poor small-scale farmers.

6. Companies wishing to carry out corporate social responsibility (CSR) activities

7. International organizations

The full methodology documents are available on INBAR website:

www.inbar.int

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Thank you!

For more information, please contact:

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