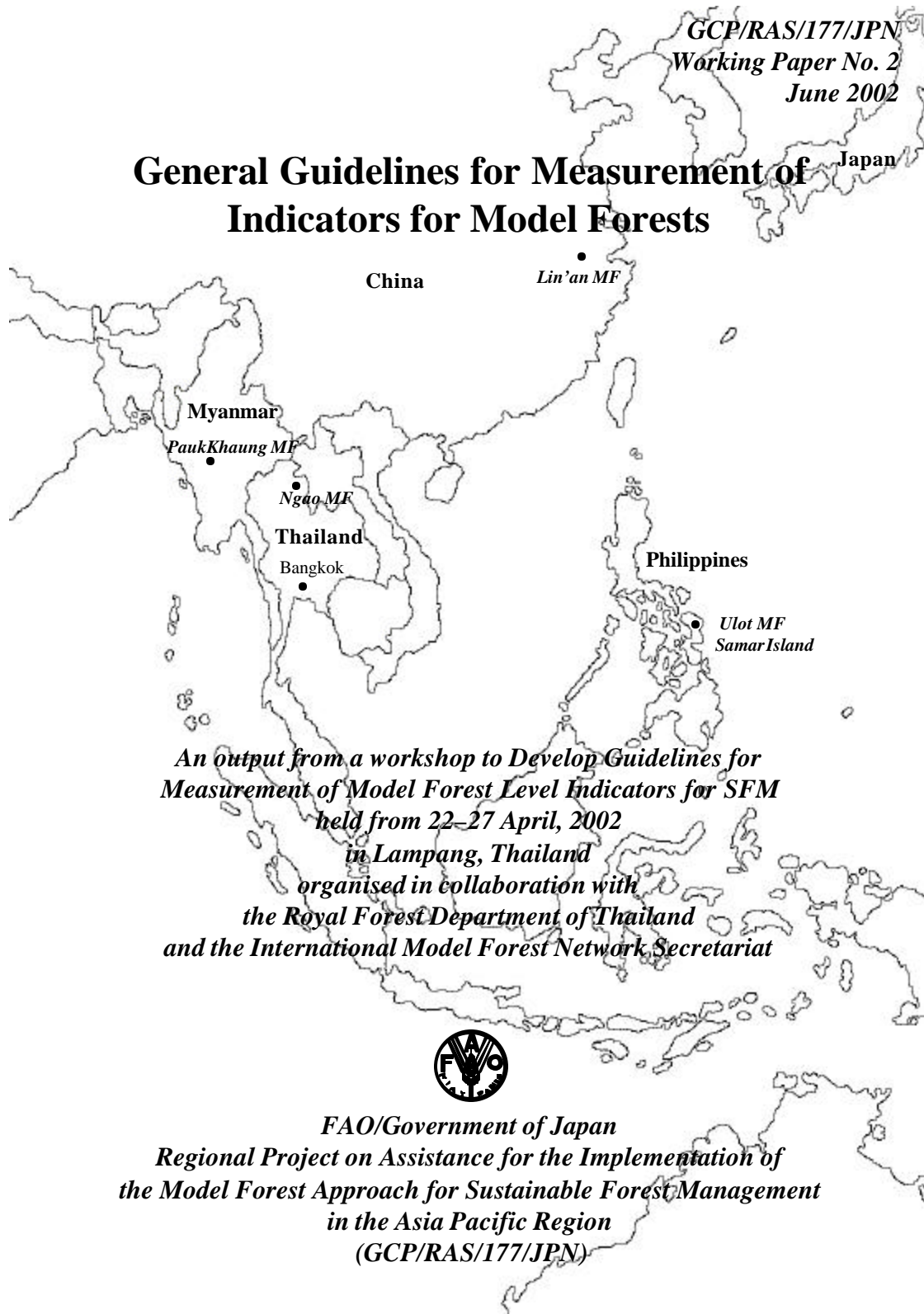


*GCP/RAS/177/JPN  
Working Paper No. 2  
June 2002*

## **General Guidelines for Measurement of Indicators for Model Forests**



*An output from a workshop to Develop Guidelines for  
Measurement of Model Forest Level Indicators for SFM  
held from 22–27 April, 2002  
in Lampang, Thailand  
organised in collaboration with  
the Royal Forest Department of Thailand  
and the International Model Forest Network Secretariat*



**FAO/Government of Japan  
Regional Project on Assistance for the Implementation of  
the Model Forest Approach for Sustainable Forest Management  
in the Asia Pacific Region  
(GCP/RAS/177/JPN)**

This Working Paper is one of a series of publications prepared during the implementation of the FAO/ Government of Japan Regional Project on Assistance for the Implementation of the Model Forest Approach for Sustainable Forest Management in the Asia Pacific Region (GCP/RAS/177/JPN, or Regional Model Forest Project, RMFP).

The RMFP is funded by the Government of Japan and executed by the Food and Agriculture Organisation (FAO) of the United Nations (UN). It is based at the FAO Regional Office for Asia and the Pacific in Bangkok, covers four countries, i.e. China, Myanmar, Philippines and Thailand, and will run for 30 months (February 2000 to July 2002). The project aims to assist the four countries to strengthen national and community-level capacities in the development and implementation of field-level model forests, and thus contribute to their efforts to use and manage their forest resources on a sustainable basis. The field-level model forests will promote partnerships among stakeholders in the planning, use and management of the model forests; “*best practices*” for SFM, taking into account the multiple uses and functions of forests, diverse demands of the stakeholders, need to balance economic, social and environmental considerations, and special needs and priorities of each country; and local, national and regional networks to facilitate collaboration and cooperation among agencies and persons involved in SFM. It will also provide technical, training and other support; and assist in the development of appropriate field manuals and guidelines.

The conclusions and recommendations given in this Working Paper are those considered appropriate at the time of its preparation. They may be modified in the light of further knowledge gained in the subsequent stages of the Project.

The designations employed, and the presentation of the materials and maps in this document, do not imply the expression of any opinion whatsoever on the part of the FAO, the Government of Japan, the RMFP or the four Project countries concerning the legal status of any country, territory, city or area, or if its authorities, or concerning the delimitations of its frontiers or boundaries.

*GCP/RAS/177/JPN  
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## Foreword

The development of model forest level Criteria and Indicators (C&I) for Sustainable Forest Management (SFM) is one of the expected outputs of the Regional Model Forest Project or RMFP (GCP/RAS/177/JPN). In order to facilitate the implementation of country initiatives on this subject, a regional workshop on "Field/Model Forest Level Criteria and Indicators for Sustainable Forest Management" was held from 10-15 June 2001 in Linan, China. The main output of the workshop was a set of "Guidelines for field level criteria & indicators for model forests" for use by the four RMFP countries. Some Project countries have translated these Guidelines into their local languages for use in developing or improving their model forest C&I.

The status of C&I development in Project countries (as well as relevant experience elsewhere) was discussed at the 3rd Regional Model Forest Workshop held from 25-29 Nov. 2001 in Pyay, Myanmar. At the workshop, indicators common to Project countries were identified. The 3rd Project Steering Committee Meeting of RMFP held in Yangon from 30 Nov.-01 Dec. recommended that a training workshop on the measurement of common indicators be organised by the RMFP to assist Project countries in the refinement and measurement of indicators in their respective model forests.

In collaboration with the Royal Forest Department (RFD) of Thailand and the International Model Forest Network Secretariat (IMFNS), the RMFP organised a regional workshop to develop guidelines for the measurement of indicators common to the four Project countries. The objectives of the workshop were to:

- a) demonstrate the processes involved in reviewing the appropriateness and effectiveness of the C&I that have been developed for the model forest;
- b) review, prioritise and select indicators that are common to the model forests in all four RMFP countries, and discuss/determine how these indicators can be best measured, and
- c) prepare guidelines for the measurement of the indicators selected in (b) above.

One of the main outputs of the workshop was the General Guidelines for Measurement of Indicators for Model Forests (that are common to the four Project countries), which is being published as RMFP Working Paper No. 2. The report of the workshop, containing the main observations and recommendations made, were endorsed by and distributed to the participants at the end of the workshop. The Proceedings of the workshop, comprising the workshop report and the papers presented will be published as RMFP Field Document No. 3.

We would like to thank the Government of Japan for their generous funding of the RMFP; the Government of Thailand for hosting the workshop; the International Model Forest Network Secretariat for co-sponsoring the workshop, the National Project Counterparts, their colleagues and their partners, and the various resource persons, for sharing their experiences and knowledge on the theme of the workshop, the various agencies for providing resource persons and other support, and all the participants for their active inputs into the workshop.

(Tang Hon Tat)  
Chief Technical Adviser  
FAO/Japan Regional Model Forest Project  
(GCP/RAS/177/JPN)

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## ***RMFP Publications***

### **A. Field Documents**

1. Proceedings of Inception Workshop of Regional Model Forest Project. 21-26 May 2000, Lin'an, China.
2. Proceedings of 2nd Regional Model Forest Workshop - "Participatory Process - Developing Partnerships That Work". 19-22 February 2001, Lampang, Thailand.
3. Proceedings of Regional Workshop on Field/Model Forest Level Criteria and Indicators for Sustainable Forest Management. 10-15 June 2001, Linan, China.
4. Proceedings of 3rd Regional Model Forest Workshop - "Criteria and Indicators for Sustainable Forest Management in Model Forests" 25-29 November 2001, Pyay, Myanmar.

### **B. Working Papers**

1. Guidelines for Field Level Criteria & Indicators for Model Forests. August 2001. (Output of regional workshop on "Field/Model Forest Level Criteria and Indicators for Sustainable Forest Management". 10-15 June 2001, Linan, China.)
2. General Guidelines for Measurement of Indicators in Model Forests. June 2002. (Output of Regional Workshop to Develop Guidelines for Measurement of Model Forest Level Indicators for SFM. 22-27 April 2002, Lampang, Thailand.)

### **C. Miscellaneous Papers**

1. The FAO/Japan Trust Fund Regional Model Forest Project. By Hon Tat Tang, Chunqian Jiang, Kyaw Htun, Adriano Nava Jnr and Jira Jintanugool. Paper presented at 4th International Workshop on Model Forests for Field-level Applications of Sustainable Forest Management, 23-27 October 2000, Yamanashi Prefecture, Japan.

### **D. Newsletters - *News on the Model Forest Approach to Sustainable Forest Management***

- |                 |                 |
|-----------------|-----------------|
| 1. October 2000 | 5. October 2001 |
| 2. January 2001 | 6. January 2002 |
| 3. April 2001   | 7. April 2002   |
| 4. July 2001    |                 |

## General Guidelines for Measurement of Indicators

### 1. Introduction

The development of C&I for SFM in the model forests (MFs) is one of the expected outputs of the RMFP. In order to facilitate the implementation of country initiatives on this subject, a regional workshop on *Field/Model Forest Level Criteria and Indicators for Sustainable Forest Management* was held from 10-15 June 2001 in Linan, China. The main output of the workshop was a set of *Guidelines for field level criteria and indicators for model forests* for use by the four RMFP countries. Some Project countries have translated these Guidelines into their local languages for use in developing or improving their model forest C&I.

The status of C&I development in Project countries (as well as relevant experience elsewhere) was discussed at the 3rd Regional Model Forest Workshop held from 25-29 Nov. 2001 in Pyay, Myanmar. The workshop facilitated a better understanding and appreciation of the experiences and lessons learnt from the work on C&I development in the Project countries and related agencies. At the workshop, indicators common to Project countries were identified, and it was recommended, *inter alia*, that ‘the RMFP explores the possibility of funding a training workshop for the preparation of data collection guidelines.’

The 3rd Project Steering Committee Meeting of RMFP held in Yangon from 30 November-01 December 2001, recommended that a training workshop on the measurement of common indicators be organised by the RMFP to assist Project countries in the refinement and measurement of indicators in their respective model forests. Some Project countries have also requested for assistance to review the appropriateness and effectiveness of the C&I that they have developed for their model forests. Such a review will require at least a full workshop by itself. Nevertheless, it is considered useful to at least discuss the processes involved in such a review at the proposed “measurement of indicators” workshop.

Therefore, the RMFP in collaboration with the Royal Forest Department (RFD) of Thailand and the International Model Forest Network Secretariat (IMFNS) organised a regional workshop from 22-27 April 2000 in Lampang, Thailand to develop guidelines for the measurement of indicators common to the four Project countries, and to discuss the processes involved in reviewing the appropriateness and effectiveness of the C&I that have been developed for the four MFs.

The workshop discussed the processes involved in reviewing the appropriateness and effectiveness of the MF level Indicators; reviewed, prioritised, and selected the common indicators; and developed guidelines for measurement of



selected indicators and demonstrated in the field during the field exercises of the workshop.

## **2. General guidelines for development**

These Guidelines were developed by participants at the workshop to '*Develop Guidelines for Measurement of Model Forest Level Indicators for SFM*', held in Lampang, Thailand from 22-27 April, 2002. They are intended for use by the four MFs in the RMFP.

The General Guidelines consist of several parts: overall guidelines, steps in developing measures and measure development forms.

### **2.1 Definitions**

A measure is an activity, either quantitative or qualitative that we use to assess an indicator. Measures may be referred to by other names including verifier, protocol or activities.

Measures provide specific details or protocols that describe the way the indicator is measured in the field, and include the source of information for the indicator; and the measurement method including the form, scale, timing and units of data gathered.

Measures provide meaningful and valid information to reveal the state of an indicator as compared against a particular reference value.

### **2.2 Types of measures**

A measure can be qualitative or quantitative, and can be assessed using scientific methods, traditional knowledge methods or both.

- A direct or proxy measure may be used.
- A proxy measure is an alternative measure that could be used - it is usually an indirect way of measuring the indicator and so is less preferable.
- Design proxy measures when preferred measures are not an option in the short-term because of insufficient available data, lack of information to inform setting a reference value, or lack of a feasible cost-effective protocol.
- The use of proxy measures is a very useful way to continue the process of sustainability monitoring with less than perfect information.

There are different kinds of measures that are useful in different situations, depending on the need (**see Table 1**). Sometimes, two different types of measures may be used for the same indicator.

Table 1. Measurement types

Measure Type	Definition
Management Process	A component of the management process or other human action measuring the activity and not the result of the activity (e.g., are seed transfer rules in place).
Enabling Condition	A broad kind of management process measure to assess whether something exists in order to create an environment that is suitable for sustainability (e.g., extent of permanent forest estate).
Input	A measure of actions taken or inputs such as time, dollars, or resources (e.g., dollars spent on stream restoration or amount of hectares reforested).
Outcome	The state or result of the action – the effect (e.g., number of forest-dependent species). Outcomes may be either short-term outcomes or long-term outcomes.

### 2.3 Place of measures in the C&I hierarchy

Measures are the means of verifying indicators. Each indicator may have more than one measure.

The C&I hierarchy in MFs is shown in **Figure 1**.

### 2.4 Common or unique measures

Measures may be common to a specific forest (country) or different. If you are able to find a measure from another forest or country that looks useful you will need to adapt it very specifically to your situation. This is particularly true for measures that have been initially written for use at a different scale (for example, regional or national). It may be possible to use the measure in your forest, but if it is adapted, it is unlikely that it will provide the critical information needed to make informed management decisions in your forest.

### 2.5 Readiness for measurement/status

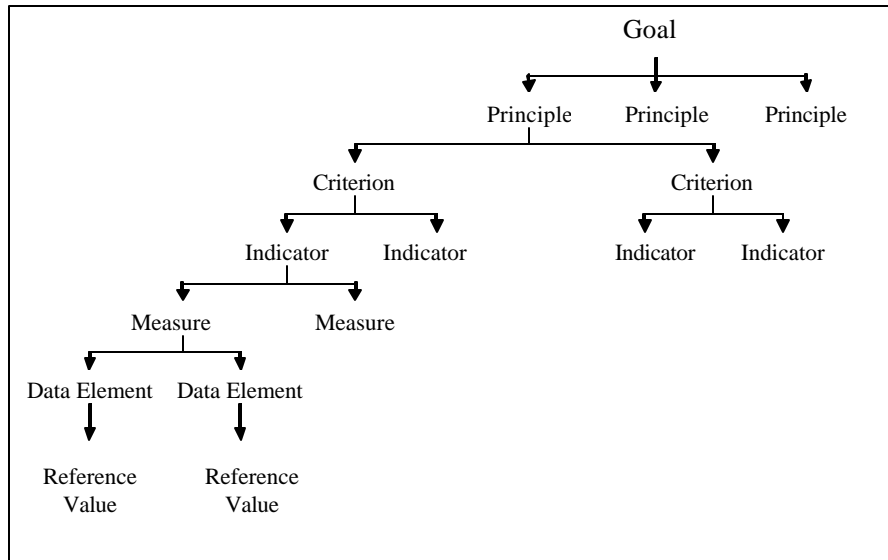
Some indicators are currently ready for measurement; others require further the development of cost-effective measures. Some measures will require research to develop more accurate, sensitive, inexpensive and/or efficient approaches.

Measures (and indicators) are not necessarily static. They will need to evolve and change as we learn more and as the issues and values change.

### 2.6 Scale

Indicators may be common among scales (e.g., national, sub-national, and local

Figure 1. C&I hierarchy



level) but the measures should be focused specifically on the characteristic of the indicator that is expressed at that scale.

Some indicators and measures at the local level, particularly for larger MFs - may be used at regional levels.

A review might be conducted (or measures categorised) based on the scale(s) the measure is likely to be appropriate at.

### 2.7 Sharing measures between indicators

Sometimes the same measure can be used to collect data for more than one indicator. In these situations it is probable that the analysis may be different and that different reference values or standards will be applied. For example a measure of road density may be used to assess an indicator related to forest access and an indicator related to forest fragmentation.

### 2.8 Sharing measures between forests

As you develop measures or record your existing measures using the common forms you should send them to other MFs for their consideration.

## 2.9 Potential resources for measures

Other organisations have developed measures which maybe useful in your situation.

One of the best resources applicable to the four MFs is the CIFOR Resource Book Database. This searchable set of indicators and measures has been built into a Microsoft Access software programme. Some of the measures (they use the term verifiers) are explained in more detail, and others just have potential measurement ideas. Background papers on the CIFOR website or on the CD have detailed document on several of the methodologies for social assessments - most of these are qualitative in nature and include very good methods of collecting information on social equity measures with local peoples in tropical forest environments. Copies of the CD are available from CIFOR ([www.cifor.cgiar.org](http://www.cifor.cgiar.org)).

Other possible sources include:

- The Canadian Model Forests (a CD reporting the results of the local level indicator assessments is available).
- Danish Forest Institute/Chiang Mai University/CIFOR paper on indicators for Thailand (currently, only verifier names have been developed).

## 2.10 Key questions that measure descriptions should answer

*Why?*

- What is your purpose of monitoring and how are you going to use the results?
- Who do you need to communicate with?
- What kind of questions will they ask?
- What kind of an answer (and information) is acceptable?
- What does the indicator mean and why is it important at that scale?
- What is the relationship between the indicator and sustainability?

Measures have different potential purposes:

- To contrast between short-term and long-term outcomes;
- To examine inputs or management processes or outcomes;
- To examine the spatial distribution of effects over the entire forest versus more localized effects (distribution); and
- To examine the distributional (equity) effects.

Different purposes are fine but conscious choice is critical.

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*What?*

- What are you trying to 'indicate'?
- What will you measure in order to verify the indicator
- What data will you use? Do you need a proxy measure?

*How?*

- How will you measure the indicator?
- What are the steps involved in measuring?
- How precise and accurate do you need to be to be repeatable and to detect change?
- What do you need to do?
- How much is it going to cost?
- What data do you need?

*Who?*

- Who is already involved with monitoring?
- Who needs to be involved?
- How do we coordinate?
- What are they currently doing - what data do they have at what scale and timing?
- Can volunteers be used/do they need training?

*When?*

- How frequently do you need to measure?
- At what time interval?
- When can change be meaningfully detected?
- What is the management decision timing?

*Where?*

- Where should you measure?
- At what scale is the data collected?
- At what scale do you need to know the answer?
- Are you conducting a census? a sample? or a case analysis?

Determining the appropriate scale at which to report information involves:

- considering the system properties of the indicator;

- identifying at what scale the measure is meaningful. This includes assessing whether data are available at a scale appropriate for analysis; and
- identifying what scale or subscales it is important to show differences.

*So what?*

- How will you make sense of the results?
- How will you analyse the information?
- What are the reporting implications?
- What are your standards or benchmarks?
- How will you examine and analyse linkages between indicators?
- How are you going to use the information to improve management - what is the remedial management action that you take if a measure is under performing?

#### **2.11 Reference values, norms, thresholds or standards**

A standard, norm, threshold or benchmark is a reference value or condition against which the verifier/data element is compared. They help us:

- Interpret what we know about an indicator;
- Force discussion about what the measurement of an indicator is telling us;
- Assess whether we are moving in the desired direction and at the right pace; and
- Identify what other things interact with or are affected by that indicator.

Reference values are not static in nature:

- May change or shift over time.
- Many will also vary not only between forests but within different areas on a forest.

Key questions for designing reference values include:

- At what point will that indicator no longer be resilient?
- Is this an absolute (discrete) standard (a yes/no type scenario)?
- What happens if you don't meet the standard?
- Does achieving this standard conflict or link to another?
- Can it ever be too good?
- When would you know it was good?
- What is the sign that the situation is bad?
- Does the standard vary by time, spatial scale, model forest?
- What condition of the indicator would trigger change or serve as a warning

light?

- How are you going to analyze the information?

Things you should document about reference values include:

- Source of standard (professional estimate, research study)
- Units of measure
- Timeframe
- Assumptions
- Spatial and temporal variations
- Inter-related indicators
- Concerns and cautions
- Potential response if standard is not achieved
- How or under what conditions the standard should be re-examined?

### **3. Steps in developing measures**

The following Steps in Developing Measures have been designed to be used in conjunction with Measurement Forms A and B and with the General Guidelines for Developing Measures.

#### **3.1 Describe and define the selected indicator**

For your specific country and MF:

- Describe the linkages between the indicator and other indicators that you are trying to explore or analyse.
- Define each of the terms in the indicator.
- Set specific objectives for the indicator through discussion of why you selected the indicator and how the indicator is related to sustainability.

#### **3.2 Identify preferred type(s) of measurement**

Determine your preferences for the type or types of measures needed to verify the indicator:

- Are you trying to measure a short-term or long-term change, or both?
- Do you want to measure whether an enabling condition or management process is in place (e.g., existence of laws and policies preventing illegal harvesting)?
- Do you want to measure inputs related to the effectiveness of the indicator (e.g., number of fines awarded or number of hours spent enforcing the forest law)?
- Do you want to measure the outcome for this indicator (e.g., volume of timber

illegally harvested)?

### 3.3 List potential measures

Develop a list of potential measures for further evaluation. Include all possibilities on this list as some may be used at a later date. Identify as many measures as possible without considering how feasible or effective they are.

- Your goal here is to come up with as many possible measures as you can think of in order that you can evaluate and select the best ones for your situation.
- You will probably want to consult other lists of measures to see if you can get ideas from them.
- This should be an inclusive process whereby everyone provides measures and they are all listed.
- In the next steps you will review the list of measures and evaluate the best ones for this indicator.
- The measures you don't use should be saved as they may be useful for other indicators or you may want to re-examine them later if your first measure doesn't work.

### 3.4 Evaluate and assess potential measures

Evaluate and assess potential measures developed in the previous step in order to identify your priority measure or measures. Remember that in many situations you will select more than one measure to verify an indicator. List the potential measures in the first column and then compare them by category. You can either assign a high, medium, low ranking to each measure or you can use a numeric ranking. This evaluation matrix is simply a guide -- the top ranked measure may not always be your preferred choice. You may decide to select another measure and work to design a methodology to compensate for its potential weaknesses. Categories include:

- *Relevance to the indicator:* How compatible is the measure with your objectives for the indicator and the type of measure you prefer?
- *Potential sensitivity of the measure to detect change:* How sensitive is the measure in detecting change? Imagine several scenarios to determine whether or not the measure will be sensitive to change.
- *Reliability and accuracy:* Will the result obtained from the measure be replicable by others and will it be an accurate measure of the indicator?
- *Skills and resources required to gather the data:* Which measure will require the fewest resources to implement?
- *Availability of data:* Is data currently available for this measure?
- *Ease of gathering and accessing data:* Does it seem likely that you will be able



to collect the appropriate data for this measure on a continuous basis? Do you expect the data to be accessible?

- *Cost effectiveness:* Which measure is the most cost effective? This may not only include the total cost but also the sources of cost for example 1 measure may require more hours of people time to measure but it may be implemented by volunteers who don't cost money.
- *Potential availability of norms or thresholds:* Do you think that reference values, norms or thresholds could be developed for this measure?

**3.5 Determine the measure or set of measures (if you pick more than one) for pre-testing.**

**3.6 Describe the measure in detail according to the components of the Measure Development Form B (instructions are provided on the form).**

- Name of measure
- Description of measure
- Definition of terms
- Status of measure
- Boundary of measurement area
- Level of precision required
- Monitoring procedures or steps
- Description of measurement tools
- Limitations or cautions
- Data storage
- Types of data analysis
- Required additional or supplementary data
- Methods of presentation
- Spatial scale
- Units of measurement
- Timing of measurements
- Monitoring frequency
- Equipment needed
- Source of data
- Sampling strategy
- Reference values
- Remedial actions

- References or key resource people/offices
- 3.7 Conduct internal and external measure reviews**
- Review preliminary measures with stakeholders and with measurement experts to identify any alternative measures and any possible improvements to preliminary measures.
- 3.8 Pre-test the selected measure**
- Try out the measurement instrument in selected areas to see if they make sense and are possible to implement.
  - Pre-test the measure in the exact kind of conditions you would plan to use for example the same physical environment and using the same people and equipment.
- 3.9 Refine the measures**
- Make changes to the measure required as a result of pre-testing.
  - Make revisions to Measurement Form B.
  - You may want to re-examine the measure against the categories in step 4 to see if you can make improvements in each of the areas.
- 3.10 Identify the final set of measures**
- Based on the reviews and pre-testing of measures select the final set of measures for the indicators.
  - Exchange measures with other MFs.
- 3.11 Implement measure and conduct continuous reviews**
- Once you have some experience applying this measure conduct periodic reviews to make any needed adjustments and thoroughly document those changes.

*Adopted by unanimous support of the participants at the 'Workshop to Develop Guidelines for Measurement of Model Forest Level Indicators for SFM', Lampang, Thailand, April 27, 2002, 11:30am.*

## Measure Development Form - Part A

### 1. Indicator Description and Definition

Indicator Name:

*Linkages to Other Indicators:*

Identify the linkages or relationships between this indicator and others.

*Definition of Terms:*

Define all of the terms in the indicator name specific to your country/Model Forest.

*Specific Objectives for Measuring the Indicator:*

Discuss why this indicator is important to achieving sustainability, and why are you trying to measure this indicator and what your specific objectives are for measuring the indicator.

### 2. Measurement Types

Based on the specific objectives you developed previously, select your preferences for the type or types of measures you want to design for this indicator.

- Enabling condition
- Management process
- Input
- Outcome: Short-term or long-term change

### 3. List of Potential Measures

Develop a list of potential measures for further evaluation. Include all possibilities on this list as some may be used at a later date.

### 4. Evaluation and Assessment of Potential Measures

Evaluate and assess potential measures developed in the previous step in order to identify your priority measure or measures. Remember that in many situations you will select more than one measure to verify an indicator.

List the potential measures in the first column (use additional pages as required) and then compare them by category. You can either assign a high, medium, low ranking to each measure or you can use a numeric ranking. This evaluation matrix is simply a guide -- the top ranked measure may not always be your preferred choice. You may decide to select another measure and work to design a methodology to compensate for its potential weaknesses.

*Evaluation and assessment of potential measure*

Potential Measures	Relevance to Indicator	Potential sensitivity of measure to detect change	Reliability and accuracy	Skills and resources required	Availability of data	Ease of data gathering or access to data	Cost effectiveness	Potential availability of reference values, thresholds or norms

**Identify your preferred measure or measure for pre-testing**

Highlight or circle the selected measures.

**Measure Development Form - Part B (Step 6)**

**Model Forest:** \_\_\_\_\_  
**Indicator Name:** \_\_\_\_\_

**Name of measure:**

**Description of measure:**

Provide a brief description or explanation of the measure if required.

**Definition of terms:**

Define all of the terms in the measure.

**Status of measure:**

Preferred measure or Proxy measure

**Boundary of measurement area**

Describe the area you would conduct the measurement in e.g., the entire Model Forest, only a selected portion (for example a National Park) or a regional area larger than the Model Forest.

**Spatial scale**

At what scale would you take individual measurements. At permanent plots, sites located on a 1 km grid, by watershed, by community etc. The spatial scale should indicate the smallest scale of measurement - what details you will be able to obtain from the data even if you might choose to aggregate data into larger units for reporting results to some audiences

**Units of measurement:**

Describe the units of measure e.g., hectares, kilometers per square kilometer, acres, seconds etc.

**Timing of measurements:**

When would you collect the data (e.g., daily, monthly, after peak rainfall events, at every community meeting)?

**Monitoring frequency:**

How often do you suggest repeating monitoring - every year, every other year, every 5 years, etc. This may be based largely on data availability (e.g., frequency with which aerial photographs or satellite images are obtained) and the critical nature of the measure and sensitivity of the measure to detect change.

**Level of precision required (circle):** *High*      *Medium*      *Low*

What is the level of precision required and what are the ways to achieve that precision (e.g., obtaining the same scale and same quality satellite images on a timely basis; using the same set of individuals to collect data on a repeated basis).

**Monitoring procedures or steps:**

Include detailed steps to collect the data (so that someone else might be able to repeat them) and any steps you might use to check the quality or accuracy of the data. Use additional documents as required.

**Description of measurement tool(s):**

Describe measurement tools (e.g., survey and data tally form) and attach to this form.

**Equipment needed:**

Describe the equipment needed to conduct monitoring (e.g., type, name and scale of map; meter stick; compass...).

**Source of data:**

Provide specific details on the source of the data, its current availability and how to obtain and access it. If this is secondary data from a map or publication specify, scale, who has the information etc.

**Sampling strategy:**

Where and how many samples will be selected? What kind of sample is this (a random sample, a strategic sample of trouble spots - please describe)?

**Reference values (norms, thresholds or standards)**

Include possible sources and methods of constructing reference values and any existing reference values that you are aware of (e.g., water quality guidelines for drinking water).

**Limitations or cautions associated with the measure:**

What are the potential limitations of the measure you have developed? Try and describe any concerns about potential data accuracy or validity that you would like the reader to think about when reviewing the results (e.g., because of limited resources we had to construct a sampling approach with a limited number of sampling points. Consequently readers should use caution in generalising results to areas that were not directly measured).

**Data storage:**

Where, when and who will store the data that has been collected and in what form? If this is electronic data specify the file names, formats, locations and descriptions (the meta-data).

**Types of data analysis:**

What kind of data analysis (be as specific as possible) should be conducted on the data? Include analysis suggestions for examining the relationships between measures or between indicator linkages.

**Required additional or supplementary data:**

What specific data or background information is an absolute requirement to analysis and interpretation of the results? For example, precipitation (rainfall) is data that without which you would not be able to analyse the meaning of a measure of level and velocity of water flow in a stream.

**Methods of presentation:**

What are the specific ways you might present the data for this measure? This will also help you identify potential requirements for data analysis.

**Remedial actions**

What management actions/remedial actions might you take if this measure is not performing up to standard? Forecast what you would do with the information you would have when you measured the indicator. Be very specific about the actions that should be considered.

**References or key resource people/offices:**

What literature or reference resources did you use or would you suggest others consult for further information on this measure? Who are the key resource people, stakeholders, agencies or offices that can help with this measure?

### **Action Plan and Next Steps**

#### **Short Term Actions**

1. Translation of guidelines for measurement into local language.
2. Model Forests should complete Measure Forms (A & B) for each indicator.
3. Review measures with other specialists, forest staff, and stakeholders to identify additional measures.
4. Pre-test the measures through data collection in the forest.
5. Revise the measures.
6. Share measures as they are developed between Model Forests.
7. Apply the measures within the Model Forest.
8. Revise the measures based on the data collection experience.

#### **Assistance/Workshop Topics**

- External assistance is needed for each Model Forest to help in reviewing and revising measures.
- After application of measures in each Model Forest, conduct a workshop to share experiences and explore application of approaches and ideas to other scales (e.g., sub-regional/national) and to other FMU areas.
- Future workshop topics, once measures have been well developed, include reference values and standards, and analysis and state of forest reporting techniques.

#### **Long Term Actions**

- Evaluation of improvement in SFM as a result of implementation of C&I.
- Workshop for dissemination of C&I approaches developed in the Model Forests to other jurisdictions.



## **Annex 4**

### **Example of suggested measures for common indicators**

The example measures that were developed for the selected common indicators during the Lampang workshop were developed in a limited time period with no outside resources and in mixed country groups. The purpose of the development of these measures was to serve as a model to test the guidelines and procedures and as a training exercise. These example measures may also help individual Model Forests in refining measures for their own purposes and thus serve as a useful starting point for full measure development. The associated measurement forms (A and B) for each of these measures are still quite general and incomplete so they should be used as a suggestion for how to proceed but not a model of a thoroughly described measure.

#### **Measure Development Form - Part A**

Country: \_\_\_\_\_  
Model Forest: \_\_\_\_\_

#### **1. Indicator Description and Definition**

**Indicator Name:** Value of wood and non-wood forest products

*Linkages to Other Indicators:*

- Climate change
- Forest area
- Standard of living

*Definition of Terms:*

- Value - economic, social and ecological.
- Wood - products from trees/timber.
- Non-wood products - minor forest products, e.g. rattan, resins, honey, bamboo shoots, mushrooms, medicinal plants, ecotourism.

*Specific Objectives for Measuring the Indicator:*

- Will contribute to economy and standard of living.
- To make a plan for harvesting and conservation.
- Able to develop database for purposes of planning, management (including options), assessment, economic valuation.
- To better understand the relationships between values.

**2. Measurement Types**

- Outcome: Short-term or long-term change

**3. List of Potential Measures**

- A) Quantity and quality of wood products.
- B) Quantity and quality of non-wood forest products.
- C) Species diversity and richness (wood and non-wood).
- D) Percentage of farmers dependent on wood/NTFP for primary income.
- E) Number of NTFP/bamboo-related businesses.

*(see over page for measurement selection)*

**Measure Development Form - Part B (Step 6)**

**Name of measure:** Quantity and quality of wood products

*Description of measure:*

*Definition of terms:*

- Quantity = number and volume.
- Quality = classification by species, age, size and grade.

*Status of measure:*

*Preferred or Proxy measure*

- Preferred

*Boundary of measurement area:*

- Model Forest

*Spatial scale:*

- Model Forest

*Units of measurement:*

- Cubic metres

*Timing of measurements:*

- Yearly

*Monitoring frequency:*

- Yearly

*Level of precision required (circle):*

- High

#### 4. Evaluation and Assessment of Potential Measure

Potential measures	Relevance to indicator	Potential sensitivity of measure to detect change	Reliability and accuracy	Skills and resources required	Availability of data	Ease of data gathering or access to data	Cost effectiveness	Potential availability of reference values, thresholds or norms
A	2	3	1	1	3	3	3	2
B	2	3	3	3	3	3	3	3
C	2	1	3+	1	4	4	4	4
D	2	3	4	3	3	3	3	4
E	3	3	1	3	2	2	2	5

*NB: A scale of 1-5 was used, indicating the importance of the measure according to each criteria, where 1=high importance/relevance, and 5=low importance/relevance*

*Monitoring procedures or steps:*

- Volume and species inventory
- Forest inventory

*Description of measurement tool(s):*

- Sampling

*Equipment needed:*

- Survey instrument
- Map
- Spiegel relascope

*Source of data:*

- Primary and secondary

*Sampling strategy:*

- Systematic

*Reference values (norms, thresholds or standards)*

- Varies by country
- Standards from international timber markets

*Limitations or cautions associated with the measure:*

- Intensity of sampling

*Data storage:*

*Types of data analysis:*

- Comparison and trend analysis

*Required additional or supplementary data:*

- Volume studies or inventory results conducted in the area by other groups

*Methods of presentation:*

- Graph, tables

*Remedial actions*

- Explore other uses
- Local processing
- Value-adding

*References or key resource people/offices:*

- Country-specific

## Annex 5. Potential Measures for Common Indicators

Common Indicators (Reconfirmed in Lampang 2002)	Type of Measure (MP, I, O,P)	Measure	Measurement Approach
Area of forest	<ol style="list-style-type: none"> <li>1. Outcome</li> <li>2. Outcome</li> <li>3. Outcome</li> </ol>	<ol style="list-style-type: none"> <li>1. Area (hectares)</li> <li>2. Species and density of trees</li> <li>3. Plantation compared to native forest</li> </ol>	
Rate of conversion of forest to other non-forest land uses	<ol style="list-style-type: none"> <li>1. Proxy</li> <li>2. Outcome</li> <li>3. Outcome</li> <li>4. Outcome</li> <li>5. MP</li> <li>6. Outcome</li> </ol>	<ol style="list-style-type: none"> <li>1. Number of shifting cultivators</li> <li>2. Area (extensity) of land converted to from native forest to other uses (including plantations)</li> <li>3. Area of land withdrawn from legal permanent forest estate</li> <li>4. Area by permanency of conversion – can they be returned to forest like agriculture or is it permanent e.g., settlement area and infrastructure</li> <li>5. Existence of laws, policies or regulations preventing forest land conversion</li> <li>6. Patch (opening) size and number by location</li> </ol>	Can use map -based or permanent forest plots
Area of forest affected by encroachment/shifting cultivation		Same approach as above but for the specific conversion by encroachment or shifting cultivation	Maps, pictures, records Can use map -based or permanent forest plots
Area of forest damaged by wild fire	<ol style="list-style-type: none"> <li>1. Outcome</li> <li>2. Outcome</li> <li>3. Outcome</li> <li>4. Outcome (for econ.)</li> <li>5. MP</li> </ol>	<ol style="list-style-type: none"> <li>1. Extensity (area) of area burned</li> <li>2. Intensity (severity) of area burned</li> <li>3. Openings or patch size created through fires compared to natural distribution</li> <li>4. Volume of wood (and non-wood products) lost through wildfire</li> <li>5. Dollars spent on fire fighting</li> </ol>	Survey, map, picture, record

Area of forest damaged by pest and diseases	<ol style="list-style-type: none"> <li>1. Outcome</li> <li>2. Outcome</li> <li>3. MP</li> <li>4. Outcome (economic)</li> <li>5. Input</li> </ol>	<ol style="list-style-type: none"> <li>1. Extensity (area) damaged by pests/disease</li> <li>2. Intensity (severity) of areas damaged by pests/disease</li> <li>3. Presence of a pest/disease control center</li> <li>4. Dollar value lost by damage to wood products</li> <li>5. Presence of known forest pests</li> </ol>	<p>Visual inspection Can use map-based or permanent forest plots</p>
Forest (ecosystem) types	<ol style="list-style-type: none"> <li>1. Outcome</li> <li>2. Outcome</li> </ol>	<ol style="list-style-type: none"> <li>1. Area by forest ecosystem types (e.g., dry dipterocarp, mixed deciduous forests)</li> <li>2. Forest structure by forest type (stand density, crown closure, height of forest layers, volume/type of coarse woody debris)</li> </ol>	
Number of (threatened) forest dependent species	<ol style="list-style-type: none"> <li>1. Outcome</li> <li>2. Input</li> <li>3. Outcome</li> <li>4. Outcome</li> <li>5. Input</li> </ol>	<ol style="list-style-type: none"> <li>1. Animals found or being heard (tracks, sounds etc).</li> <li>2. Area in ecological communities suitable for threatened species</li> <li>3. Presence of species from point surveys, transects etc</li> <li>4. Abundance of species (number within each species) from point surveys, transects etc</li> <li>5. Number of species listed as threatened potentially present in the area (based on habitat types)</li> </ol>	<p>Sounds and volume # of rare species Can use map-based or permanent forest plots</p>
Existence of/area under a forest management plan	<ol style="list-style-type: none"> <li>1. MP</li> </ol>	<ol style="list-style-type: none"> <li>1. Hectares (area) within approved management plan, land use plan, community management framework, annual work plan, or certified.</li> </ol>	<p>Comparison of maps or legal surveys</p>

Balance between growth/AAC and amount harvested	<ol style="list-style-type: none"> <li>1. Outcome</li> <li>2. MP</li> </ol>	<ol style="list-style-type: none"> <li>1. Harvest volume v.s. annual allowable cut (by species e.g., bamboo, rattan, trees)</li> <li>2. Management system in place to determine annual allowable cut</li> </ol>	
Area affected by soil erosion	<ol style="list-style-type: none"> <li>1. Outcome</li> <li>2. Outcome</li> <li>3. Outcome</li> <li>4. Outcome</li> <li>5. Proxy</li> </ol>	<ol style="list-style-type: none"> <li>1. Number of hill slope failures (landslides) by source and location</li> <li>2. Volume (or depth of slide) of displaced material</li> <li>3. Amount of bare ground</li> <li>4. Soil loss (by volume)</li> <li>5. Increased stream turbidity</li> </ol>	<ol style="list-style-type: none"> <li>1. Photograph, mapping</li> <li>2. Field measures or aerial photographs for remote estimates</li> <li>3. Quadrat estimates</li> <li>4. Quadrat or observation estimates</li> <li>5. Direct measures (secchi disc)</li> </ol> <p>Can use map-based or permanent forest plots</p>
Water quality	<ol style="list-style-type: none"> <li>1. Outcome</li> <li>2. Outcome (index)</li> <li>3. Outcome (proxy)</li> <li>4. Proxy</li> </ol>	<ol style="list-style-type: none"> <li>1. Turbidity, velocity, stream flow, sedimentation, pH, temperature</li> <li>2. Index of biotic integrity</li> <li>3. Presence of indicator species requiring clear water (e.g., softshell turtle)</li> <li>4. Visually observable clear water</li> </ol>	<ol style="list-style-type: none"> <li>1. Direct stream measurements (e.g., secchi disk, thermometer)</li> <li>2. Measure of fish or aquatic insect diversity as bio-indicator of water quality</li> </ol>

Area and percent of forest managed for soil and water conservation	<ol style="list-style-type: none"> <li>1. MP or input</li> <li>2. Outcome (for water quality see above)</li> </ol>	<ol style="list-style-type: none"> <li>1. Hectares (area) managed specifically for soil and water conservation by type of management (include riparian conservation areas, soil and water special management areas)</li> <li>2. Soil quality <ul style="list-style-type: none"> <li>- Soil moisture (presence of indicator plants or direct soil moisture measures)</li> <li>- Crown closure</li> <li>- Soil depth (by soil type)</li> <li>- Soil pH, carbon levels etc</li> <li>- Soil litter depth and decay rates</li> </ul> </li> </ol>	<ol style="list-style-type: none"> <li>1. Comparison of designated areas, tenures and agreements, conservation set-asides</li> </ol>
Area/number of sites managed for protection of cultural values	<ol style="list-style-type: none"> <li>1. Input</li> </ol>	<ol style="list-style-type: none"> <li>1. Area or number of sites managed to protect values</li> </ol>	
Value of wood and non-wood forest products	<ol style="list-style-type: none"> <li>1. Outcome</li> <li>2. Outcome</li> <li>3. Input</li> <li>4. Proxy</li> <li>5. Proxy</li> </ol>	<ol style="list-style-type: none"> <li>1. Market value (by volume) of wood and non-wood forest products</li> <li>2. Sale price compared to asking price</li> <li>3. Value added to products through local production (in dollars)</li> <li>4. Number (and type) of value-added processing jobs</li> <li>5. Establishment of plantations, harvest areas etc.</li> </ol>	
Employment	<ol style="list-style-type: none"> <li>1. Outcome</li> <li>2. Outcome</li> <li>3. Input</li> <li>4. Outcome (linkage)</li> <li>5. Outcome (linkage)</li> <li>6. Outcome</li> <li>7. Outcome</li> <li>8. Outcome</li> </ol>	<ol style="list-style-type: none"> <li>1. Number of people employed (by area, type of job)</li> <li>2. Employment distribution (part-time/full-time, gender, age, community, education level)</li> <li>3. Number of new jobs created</li> <li>4. Number employed by worker safety incidents (are they good jobs)</li> <li>5. Number employed in informal work sector (e.g., underground economies)</li> </ol>	



Employment		<ul style="list-style-type: none"> <li>6. Wages (income) by employment (are they good jobs)</li> <li>7. Percentage of livelihood 'income' provided through subsistence activities</li> <li>8. Employment (and income) in direct versus value-added jobs</li> </ul>	
Degree of public participation in forest management			
<b>Legal and policy framework</b>			
Existence of long term strategy/land use plan	<ul style="list-style-type: none"> <li>1. MP</li> <li>2. MP</li> </ul>	<ul style="list-style-type: none"> <li>1. Existence of land use plan or long-term strategy (or area under land use plan)</li> <li>2. Presence of sustainability objectives in long-term strategy</li> </ul>	
Existence and implementation of guidelines/codes of practice	<ul style="list-style-type: none"> <li>1. MP</li> <li>2. Input</li> </ul>	<ul style="list-style-type: none"> <li>1. Existence of codes of practices or guidelines</li> <li>2. Resources (time, people, money) devoted to implementation of guidelines</li> </ul>	
Level of investment in forest management	<ul style="list-style-type: none"> <li>1. Input</li> <li>2. Input</li> <li>3. Outcome</li> </ul>	<ul style="list-style-type: none"> <li>1. Dollars by area and by topic (e.g., conservation, enforcement, planning, research) including volunteer hours and in-kind contributions</li> <li>2. Dollars received (as above) compared to those requested</li> <li>3. Extent of task or management acts completed</li> </ul>	
Adequacy and timeliness of information	<ul style="list-style-type: none"> <li>1. Input</li> <li>2. Input</li> </ul>	<ul style="list-style-type: none"> <li>1. Are inventories complete and up-to-date?</li> <li>2. Assessment of number of management decisions informed with adequate information (survey or review of decision-making documents)</li> </ul>	

Type of Measure: MP=management process or enabling condition, I=input, O=outcome, P=proxy