



**Royal Government of Bhutan**



Ministry of Agriculture and Forests  
Department of Forests and Park Services  
Social Forestry and Extension Division

**Guidelines for Monitoring and Evaluation of  
Plantation and Forest Nursery**

Social Forestry and Extension Division  
Royal Government of Bhutan

October, 2019



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P.O Box 130, Thimphu

Bhutan

## Foreword

The first forest plantation started in the country during 1940-1947. Prior to 1961, there was free access to forest resources and the forest management was based on knowledge practice belief system. With the start of first Five Year Plan (FYP) in 1961, the move towards plantation forestry started in larger scales with conservation policies and rules in place. From 1980s, the forest conservation was given high priority with emphasis on principles of sustainable forest management. Since then, the plantation has become one of the major national forestry programmes. An annual plantation target of 400 hectares was set during the 11<sup>th</sup> FYP which has been successfully achieved and further same annual target has been set for the 12<sup>th</sup> FY Plan.

Though, substantial achievement had been made in the past, but much need to be strengthened particularly in the monitoring and evaluation (M&E) of the plantation programme. The Department has experienced number of constraints while carrying out M&E like missing plantation journals, difficulty in locating plantation sites in the field, duplication of records, poor survival, lack of accountability etc. Though, the plantation M&E started sometime in mid-1990, but due to absence of standard guidelines, it's always been difficult in carrying out effective M&E in the field. To overcome various issues, problems and constraints, the Department felt necessary to have standard M&E guidelines in place as a tool to verify and document the forest plantations in the country.

The Social Forestry and Extension Division under Department of Forests and Park Services has conducted a consultative stakeholder workshop for field focal staffs from Territorial Divisions/Parks and other relevant agencies and jointly developed a simple, doable and practical M&E guidelines for plantation. This guideline will enable and facilitate field staff and other relevant stakeholders to monitor and evaluate nationwide plantation programmes in the country.

We therefore, expect all field offices and relevant stakeholders to use this guideline as a tool to effectively monitor and evaluate the plantation and nursery programmes and maintain up-to-date information on plantation and nursery programmes in times to come and make it more successful.



Lobzang Dorji

(Director)

Department of Forests and Park Services

## Acknowledgement

The plantation as a national priority programmes, made substantial achievement during the past years, and the Department has further set 2000 hectares of climate smart restoration including plantation in 12<sup>th</sup> FYP. The plantation area trend is steadily increasing where the Department needs greater attention to do regular assessment for plantation programmes and make it more successful. To assess plantation programme, the monitoring and evaluation (M&E) as a tool is essential to generate information vital for the purposes of planning, formulation of development policies and programme, and provide efficient services delivery systems and draw lessons which may be widely applicable in M&E systems. A proper M&E system will ensure regular feedback mechanisms, judicious mobilization of resources, effectiveness, efficiency, accountability, relevance and sustainability.

Hence, to ensure proper plantation and nursery M&E system in place, Social Forestry and Extension Division (SFED) under Department of Forests and Park Services (DoFPS) in consultation with field focal plantation officers of Territorial Divisions/Park Offices and other relevant stakeholders has jointly developed M&E guideline for plantation and nursery programmes. Particularly to this, I on behalf of SFED would like to thank Honourable Director, DoFPS for rendering kind support to develop this M&E guideline. I extend my heartfelt thanks and gratitude to all plantation focal officers and other relevant stakeholders for their valuable contributions which would have not been possible without their participation. I am very much thankful to the World Bank (REDD+ Readiness, additional Funding Project) maintained under Watershed Management Division (WMD) for financing support to develop this M&E guidelines.

Lastly, I am very much confident that, this guideline will suit the current field conditions and serves as the main tool to address monitoring and evaluation issues and ultimately contributes to better and successful plantation and nursery programmes which would benefit environmentally, socially, economically and even culturally in the time of climate change. This guideline is also envisaged to benefit maintaining reliable information on plantation and nursery programmes in the country.



Karma Jigme Tempheh  
(Chief Forestry Officer)  
Social Forestry and Extension Division

## Acronyms

BBPL	Bhutan Board Products Limited
BCCL	Bhutan Carbide and Chemical Limited
CFO	Chief Forestry Officer
DoFPS	Department of Forests and Park Services
FIRMS	Forest Information Reporting and Monitoring System
FMU	Forest Management Unit
FRMD	Forest Resources Management Division
FYP	Five Year Plan
GBCL	Green Bhutan Corporation Limited
GFO	Gewog Forestry Officer
GPS	Global Positioning System
NRDCL	Natural Resources Development Corporation Limited
PA	Protected Area
RO	Range Officer
SFAS	Social Forestry and Afforestation Section
SFED	Social Forestry and Extension Division
WMD	Watershed Management Division

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## 1. Background

Since mid-1990s, the nationwide monitoring and evaluation (M&E) of plantation programmes started by the Department to verify and assess the plantations created by different stakeholders and to make the programmes successful. The then, Social Forestry and Afforestation Section (SFAS) was mandated for nationwide M&E of the plantation programmes. Since then, Social Forestry and Extension Division (SFED) has been mandated to ensure that the plantations are raised successfully as per the prevailing norms and standards for nursery and plantation. The M&E is a broad term used for the activities whose results could be observed within a shorter period of time. But in our context (forest crops), it is difficult to get a concrete M&E results during the establishment phase of the plantation due to long gestation period of forest crops.

The M&E as a management tool will help review progresses and identify problems in planning and implementation, and help in adjustments for making likely differences. On the other hand, the plantation database maintenance is crucial for strategic planning, implementation and draw lessons for future way forward recommendations. In addition, information on plantation is essential for carrying out long term impact assessment in environmental, ecological, social context and economic cost benefit analysis for various categories of plantations.

Over the past years, it has always been a difficult experience for the Department to follow up on various categories of plantations activities mainly due to poor M&E system. The M&E as a management tool will ensure that the forest tree crops are raised in adherence with the technical regulations developed by the Department from time to time. The proper M&E system in place will ensure judicious mobilization and use of resources, effectiveness, efficiency, accountability, feedback mechanisms, relevance and sustainability. However, the Department is still lacking effective M&E system for plantation and nursery programmes mainly due to absence of a standard M&E guideline which always has been very difficult to carry out effective M&E in the field. Hence, there is a need to have standard M&E guidelines for efficiency, effectiveness, relevancy and accountability of the plantation and nursery programmes. To review and develop the M&E guidelines for plantation and nursery, the SFED has conducted a stakeholder consultation workshop for field plantation focal officers and other relevant stakeholders. This guideline was developed based on the inputs received from the field offices and will suit the current field conditions and serves as the main tool to address M&E issues in the country.

## **2. Objectives**

The plantation should be created with clear objectives and purposes in long-term. So, in the long-term, the plantations that were created and maintained should gear towards fulfilling the objectives which were set during the initial creation. The status of forest plantations and nurseries at a given reference year can be known only through efficient M&E system. The plantations and nurseries, both new and old need to be regularly monitored and improved to ensure a good quality forest stock for present and future. General objectives of plantation and nursery M&E are as follows:

- To verify whether the plantations and nurseries are raised as per the technical estimates and specifications,
- To evaluate the status and survival percentage of the plantations and nurseries,
- To provide recommendations/rectifications for improvement,
- To update the plantation and nursery record of Bhutan on annual basis for future reference.

## **3. Institutional and Implementation Arrangement**

- All Territorial Forest Divisions (TFD)/Protected Area (PA) shall be responsible for conducting timely M&E within their respective jurisdiction and issue rectification measures to the implementing agencies if deemed necessary and subsequent follow-up,
- The SFED is the focal agency to facilitate plantation and nursery programmes and provide technical support, monitor and evaluate the plantations and nurseries,
- The SFED will carry out M&E where necessary and periodically to assess the status and impact of plantations and nurseries,
- The TFD/PA shall be responsible for setting targets in the FYP and prepare annual plan based on field situation,
- The Natural Resources Development Corporation Limited (NRDCL) shall carry out reforestation in the logging areas in Forest Management Units (FMU) and also raise commercial plantation in the potential barren and degraded forestland,
- Green Bhutan Corporation Limited (GBCL) shall be the agency responsible for carrying out the entire plantation works (both new creation and maintenance of old plantations) except for the special or national significant plantation programmes,
- The Bhutan Board Product Limited (BBPL) and Bhutan Carbide and Chemical Limited (BCCL) and other industrial firms will also carry out plantations on leased out land based on the agreement,

- All field Divisions and PA should adopt good coordination linkages between the implementing agencies and clarify clear roles and responsibilities for planning, execution and M&E of the plantation and nursery programmes.

#### **4. Agencies Responsible for Monitoring and Evaluation**

All forest plantations and nurseries are subjected to M&E at different period of establishment at two levels. The monitoring of the plantation starts from planting the seedling till it established depending upon ecological sites. Some plantations may be well established after 5 years and some may take only 3 years to establish.

1. At the implementing agency level, the concerned implementing agencies shall conduct M&E by forming a team from different stakeholders. The implementing agencies at the field levels are TFD/PA, GBCL, NRDCCL and other field implementing agencies/stakeholders. The annual M&E report for plantation and nursery should be submitted to DoFPS.
2. At the Department level, the entire plantation and nursery; irrespective of the agencies responsible for creation shall be subjected to M&E by SFED when deem necessary. Forest Resources Management Division (FRMD) being responsible for reviewing and processing of Forest Management Unit (FMU) Plan, SFED with FRMD shall jointly evaluate the plantation created by NRDCCL and Industrial firms only if necessary.

#### **5. Use of Forms and Templates**

##### **5.1. The Plantation and Nursery Journals**

The plantation and nursery journals are very important to locate sites on the ground with the help of maps and descriptions. They serve as a reference to carry out appropriate follow up on the plantations and nurseries created in the past as well as maintain history of plantations where change in vegetation can be understood. All implementing field offices should maintain plantation and nursery journals developed and issued by the Department (Annex 8 and 9). At the national level, Forest Information Reporting and Monitoring System (FIRMS) under FRMD is responsible to maintain information, however, SFED may also collate information from various agencies and maintain the plantation and nursery database for their use.

##### **5.2. General Information**

The general information which could be filled in from the technical sanctions, estimates and document should be done prior to field visit (Annex 1).

### **5.3. Regular Monitoring, Evaluation and Reporting**

- Prior to field visit, the monitoring team should note that some of the information could be filled in from the documents, technical sanctions and estimates (Annex 2).
- All implementing field offices and relevant stakeholders should carry out regular M&E of the plantation creation and maintenance works. The focus of this exercise will be to assess, verify and ensure that the following inputs/criteria are delivered in the afforestation and reforestation programmes as per the technical regulations.
  - ✓ Selection/identification of feasible plantation and nursery sites,
  - ✓ Site clearance including weeding and cleaning,
  - ✓ Quality of seedlings and planting pits,
  - ✓ Choice of species and composition,
  - ✓ Casualty replacement,
  - ✓ Fencing and replacement of fencing materials,
  - ✓ Survival percentage,
  - ✓ Growth information and condition of species planted,
  - ✓ Biotic and abiotic interference and suggestive measures,
  - ✓ Any unforeseen problems etc.
- Create electronic excel sheet database and update information after every field visit (Annex 4 and 5) and report to the Department/SFED.

### **5.4. Midterm and Long-term Plantation/Nursery Evaluation and Reporting**

- The team from SFED/FRMD may conduct M&E in the respective category of plantations/nurseries whenever it is deemed necessary,
- All respective TFD/PA shall conduct midterm and final evaluation (survival assessment) of the plantations (Annex 3),
- Quick reference to survival percentage based on plant to plant spacing is annexed for ready references in the field (Annex 7),
- The evaluation team along with the implementing agencies shall judge the success of plantation/nursery (midterm evaluation) and further recommend if any remedial measures are required,
- The midterm and final evaluation reports shall be submitted to the Department/SFED,
- The evaluation reports which require technical intervention shall be presented to the Technical Advisory Committee (TAC) of the Department for further review and strategic planning and implementation by SFED.

- Create electronic excel sheet database and update information after every field visit (Annex 6) and report to the Department/SFED.

## **6. Prerequisite for Plantation/Nursery Monitoring and Evaluation**

- 1) Monitoring standard (objective, methods, expected outcome, etc),
- 2) Work plan with time line,
- 3) Geo-reference points,
- 4) Shape file and location map,
- 5) Plantation/Nursery Journal,
- 6) Tools and equipment,
  - i. Recording format,
  - ii. Notebook,
  - iii. Pen/Pencil,
  - iv. Eraser,
  - v. GPS,
  - vi. Measuring tape,
  - vii. Calculator,
  - viii. Camera,
- 7) Manpower.

## **7. Methodology and Approaches for Monitoring and Evaluation**

### **7.1. Sampling Methods and Intensity for Monitoring and Evaluation**

- 1) Sampling design for number of sample plots generation and assessment can be carried out by using GIS or QGIS or other Geo software,
- 2) Generate at least 2 percent sampling intensity of the total plantation area by using GIS or QGIS or other Geo software,
  - Basis for organised plantation survival assessment method for good representation and accuracy;
  - 2 percent sampling intensity is intended to check and balance at par with manpower, time, cost (including labour) and other resources of the implementing agencies and stakeholders;
- 3) Follow either of the random or systematic (at every 50-meters interval on the cruise line drawn from the baseline) sampling until such time the *Shape File* for all plantation is ready or in place,
- 4) Conduct reconnaissance survey for sample plots selection (in case of random sampling method),
- 5) Follow sampling plot size of 15-meter by 15-meter (either of the random or systematic) and should be measured for counting number of surviving (planted) seedlings within the sample plot,

- 6) A minimum of 3 numbers of sampling plots (poor, moderate and good site conditions) are required for measurement and assessment. Refer table below for more detail on sampling intensity and measurement.

Sampling intensity for evaluation of plantation				
Area (hectare)	No. of sample plots	Average sample plots	Suggested sample plots	Plot size (Meter)
Less than 1 hectare, a minimum of 3 sample plots to be measured and assessed			3	15x15
1-4	1-3	2	3	15x15
5-10	5-9	7	6	15x15
Above 10 hectares, a minimum of 9 sample plots to be measured and assessed or follow as specified under	9	9	9	15x15
11-15	10-13	12	12	15x15
16-20	14-18	16	15	15x15
21-25	19-22	21	21	15x15
26-30	23-27	25	24	15x15
31-35	28-31	30	29	15x15
36-40 and above	32-36	34	33	15x15

## 7.2. Formula to Calculate Survival Percentage

$$\text{Total No. of seedlings in a plot} = \frac{\text{Size of plot (15mx15m)}}{\text{Plant to plant distance (2.5mx2.5)}} = 36 \text{ Nos.}$$

$$\text{Survival percentage in a plot} = \frac{\text{No. of surviving seedlings in plot}}{\text{Total number of seedlings in a plot}} \times 100$$

$$\text{Survival percentage in a plot} = \frac{\text{No. of surviving seedlings in plot}}{36} \times 100$$

$$\text{Average survival percentage of the site} = \frac{\text{Sum of surviving percentage}}{\text{Number of plots surveyed}}$$

### 7.3. Basis for Calculating number of Sample Plots

<p>2% sampling intensity in 1- hectare area.          = 10000m<sup>2</sup> (1 hectare)          = 2% of 10000m<sup>2</sup>          = 200m<sup>2</sup>          = 200/sample plot area of 15mx15m          = 200/225 (number of sample plots in 1 hectare)          = 0.89 (equivalent to 1 sample plot)</p>	OR	<p>2% sampling intensity in 1- hectare area.          = 10000m<sup>2</sup> (1 hectare)          = 225m<sup>2</sup> (15x15m sample plot)          = 10000/225 (number of sample plots in 1 hectare)          = 44.44 plots in 1 hectare          = 2% of 44.44 sample plots          = 0.89 (equivalent to 1 sample plot)</p>
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### 7.4. Grading of Plantation Performance based on Survival Percentage

<b>Grading of plantation performance based on survival percent</b>			
<b>Sl. No</b>	<b>Survival percentage</b>	<b>Ranking code</b>	<b>Grade</b>
1	Above 76	A	Very Good
2	51-75	B	Good
3	26-50	C	Satisfactory
4	Below 25	D	Poor/Failure

## 8. Seasonal Calendar for Plantation Activity Planning, Implementation, Monitoring and Evaluation

### 8.1. Seasonal Calendar for Plantation Activity Planning and Implementation

Seasonal Calendar for Plantation Activities													
Sl. No.	Activities	Jan	Feb	March	April	May	Jun	July	Aug	Sept	Oct	Nov	Dec
<b>I</b>	<b>PREPARATORY WORKS</b>												
a	Finalization of fund												
b	Site selection, Survey and estimation												
c	Verification of estimates and accord Technical Sanctions												
d	Release of plantation budget												
e	Purchase fencing materials												
<b>II</b>	<b>PLANTATION WORKS</b>												
a	Clearing of plantation sites												
b	Fencing works												
c	Stacking and planting pit digging												



## 8.2. Seasonal Calendar for Plantation Monitoring and Evaluation

MONITORING SEASONAL CALENDAR FOR CREATION OF PLANTATION												Responsible
SN	Activity	1 <sup>st</sup> Year		2 <sup>nd</sup> Year		3 <sup>rd</sup> Year		4 <sup>th</sup> Year		5 <sup>th</sup> Year		
		Jan - Aug	Dec - Jan	May - Aug	Dec - Jan	May - Aug	Dec - Jan	May - Aug	Dec - Jan	Jan - Aug	Dec - Jan	
1	Site clearance											Chief Forestry Officer (CFO), Range Officer (RO), Gewog Forestry Officer (GFO), Unit in-charge
2	Alignment and stacking											
3	Spacing maintained											
4	Pit size as per technical sanction											
5	Type of seedlings											
6	Quality of seedlings											
7	Fencing post											
8	Barbed wire strand maintained											
9	Information maintained											
	a). Plantation Journal											
	b). Work measurement book											
	c). Sign board											
10	Others (specify)											
	a).											
	b).											
	c).											
	d).											
MONITORING SEASONAL CALENDAR FOR MAINTENENCE OF PLANTATION												Chief Forestry Officer (CFO), Range Officer (RO), Gewog Forestry Officer (GFO), Unit in-charge
1	Weeding											
2	Cleaning											
3	Fencing repair											
4	Casualty replacement											
	a). Quantity of seedlings											
	b). Types of species											
	c). Quality of seedlings											
5	Others (specify)											
	a).											
	b).											
	c).											
	d).											

### 8.3. Seasonal Calendar for Plantation Evaluation

SEASONAL CALENDAR FOR PLANTATION EVALUATION				Responsible
SN	Activity	Midterm Assessment 2 <sup>nd</sup> Year	Final Evaluation 4 <sup>th</sup> Year	
		Nov-Feb	Nov-Feb	
1	Survival rate			Social Forestry and Extension Division (SFED), Chief Forestry Officer (CFO), Park Manager (PM), Range Officer (RO), Green Bhutan Corporation Limited (GBCL), Natural Resources Development Corporation Limited (NRDCL), and Funding Agency
2	Growth information			
3	Biotic pressure			
4	Maintenance (weeding and cleaning)			
5	Casualty replacement			
6	Need for fencing repair			
7	Choice of species			
9	Pest and diseases			
10	Plantation journal			
10	Others (specify)			
	a).			
	b).			
	c).			
	d).			
	e).			
	f).			
	g).			

Use seasonal calendars for strategic planning, execution, timely monitoring and evaluation of the plantation and nursery programme.

## 9. Plantation Monitoring and Evaluation

### 9.1. General Information on Plantation

<b>Format 1. General Information Sheet</b>		
Name of Plantation:		
Objectives of plantation:		
Creation Year (DDMMYYYY):	Area (hectare):	
	Altitude:	
Financial Year:	Aspect:	
Division/PA:	Slope percent:	
Range/PA name:	Soil types:	
Dzongkhag:	Fund source:	
Gewog:	Expenditure (Nu.):	
Type of plantation:	Point reference with plantation area map	Northing:
Location name:		Easting:
Existing forest types in the surrounding area:		
Species planted:		
Brief description of the plantation site:		
Remarks on new plantation:		

The printed or scanned copy of this information sheet can be used as check list while monitoring and evaluation of the plantation. Always make a copy and use along with format 2 and format 3 as background information during field visit and assessment of the plantation.

## 9.2. Regular Plantation Monitoring and Evaluation

<b>Format 2. Regular Plantation Monitoring and Evaluation Sheet</b>					
<b>Year of plantation maintenance (tick)</b>	<b>1<sup>st</sup> [    ]</b>	<b>2<sup>nd</sup> [    ]</b>	<b>3<sup>rd</sup> [    ]</b>	<b>4<sup>th</sup> [    ]</b>	<b>5<sup>th</sup> [    ]</b>
Date of visit (DMY)	:	:	:	:	:
Species planted/ casualty replacement:					
<b>General observations (tick or mark Yes or No)</b>	<b>Excellent</b>	<b>Very Good</b>	<b>Good</b>	<b>Poor</b>	<b>Very Poor</b>
1. Overall survival					
2. Fencing repair					
3. Weeding/ cleaning					
4. Seedling/Casualty refilling					
5. Anthropogenic pressure					
6. Cattle pressure					
<b>7. Others (specify)</b>					
i).					
ii).					
iii).					
iv).					
Any human wildlife conflict:					
Any feedback received from the implementers:					
Comments/suggestion for improvement:					
Monitoring team members:					

Name and signature of the monitoring team leader:

### 9.3. Format 3. Midterm and Long-term Plantation Evaluation

Format 3. Midterm and Long-term Plantation Evaluation Sheet																	
Date: (DMY)	Name of plantation	Location name	Area (hectare)	Plant to plant spacing	No. of live seedling in the sampling plot									Survival percent	Outcome	Impact	Source of verification
					Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9				
<b>Total</b>																	
<b>Average</b>																	
Justification if survival percentage is below 30 percent:																	
Any critical remarks and recommendations:																	
Evaluation team members:																	

Name and signature of the evaluating team leader:

## 10. Reporting Structure for Monitoring and Evaluation of Plantation

### 10.1. Reporting for Plantation Creation

Format 4. Reporting for Plantation Creation															
Division/ PA	Dzongkhag	Gewog	Name of plantation	Location Name	Range/PA Name	Type of Plantation	Area (ha.)	Creation Cost (Nu.)	Fund Source	Creation Year (DMY)	Implementer	Remarks	Point Reference		
													Northing	Easting	

### 10.2. Reporting for Plantation Maintenance

Format 5. Reporting for Plantation Maintenance												
Division/ PA	Dzongkhag	Gewog	Name of plantation	Location Name	Range/PA Name	Type of Plantation	Area (ha.)	Maintenance Cost (Nu.)	Fund Source	Maintenance Year (DMY)	Implementer	Remarks



## **10.4. Report Writing for Plantation Monitoring and Evaluation**

Summary

Index

1. Background (introduction, objectives)

2. Achievement and discussions

2.1. Plantation Creation

- Brief write-up based on reporting format 4 for plantation creation.

2.2. Plantation Maintenance

- Brief write-up based on reporting format 5 for plantation maintenance.

2.3. Plantation Survivability Assessment

- a- Brief write-up based on reporting format 6 for plantation evaluation.

3. Problems and constraints

- Problems and constraints observed and received during the process of implementation.

4. Lessons learnt and feedback

- Lessons learnt and feedbacks from the implementation.

5. Recommendations

- Way forward suggestions and recommendations.

6. Conclusion

References

Annexure

## Annexure

### Annex 1. General Information on Plantation

Format 1. General Information Sheet		
Name of Plantation:		
Objectives of plantation:		
Creation Year (DDMMYYYY):	Area (hectare):	
	Altitude:	
Financial Year:	Aspect:	
Division/PA Office:	Slope percent:	
Range/PA name:	Soil types:	
Dzongkhag:	Fund source:	
Gewog:	Expenditure (Nu.):	
Type of plantation:	Point reference with plantation area map	Northing:
Location name:		Easting:
Existing forest types in the surrounding area:		
Species planted:		
Brief description of the plantation site:		
Remarks on new plantation:		

## Annex 2. Regular Plantation Monitoring

Format 2. Regular Plantation Monitoring and Evaluation Sheet					
<i>Year of plantation maintenance (tick)</i>	<i>1<sup>st</sup> [ ]</i>	<i>2<sup>nd</sup> [ ]</i>	<i>3<sup>rd</sup> [ ]</i>	<i>4<sup>th</sup> [ ]</i>	<i>5<sup>th</sup> [ ]</i>
Date of visit (DMY)	:	:	:	:	:
Species planted/ casualty replacement:					
<i>General observations (tick or mark Yes or No)</i>	<i>Excellent</i>	<i>Very Good</i>	<i>Good</i>	<i>Poor</i>	<i>Very Poor</i>
1. Overall survival					
2. Fencing repair					
3. Weeding/ cleaning					
4. Seedling/Casualty refilling					
5. Anthropogenic pressure					
6. Cattle pressure					
<b>7. Others (specify)</b>					
i).					
ii).					
iii).					
iv).					
Any human wildlife conflict:					
Any feedback received from the implementers:					
Comments/suggestion for improvement:					
Monitoring team members:					

Name and signature of the monitoring team leader:

### Annex 3. Midterm and Long-term Plantation Evaluation

Format 3. Midterm and long-term plantation evaluation sheet										
Date: (DMY)	Name of plantation	Location name	Area (hectare)	Plant to plant spacing	No. of live seedling in the sampling plot		Survival percent	Outcome	Impact	Source of verification
					Plot 1					
					Plot 2					
					Plot 3					
					Plot 4					
					Plot 5					
					Plot 6					
					Plot 7					
					Plot 8					
					Plot 9					
<b>Total</b>										
<b>Average</b>										
Justification if survival percentage is below 25 percent:										
Any critical remarks and recommendations:										
Evaluation team members:										

Name and signature of the evaluating team leader:







**Annex 7. Quick references to survival percentage based on plant to plant spacing in 15 by 15 meter sampling plot**

1.5 by 1.5 meter		2 by 2 meter		2.5 by 2.5 meter		3 by 3 meter		3.5 by 3.5 meter		4 by 4 meter	
Count of surviving seedling, sapling	Percent										
0	0	0	0.0	0	0.0	0	0	0	0	0	0
1	1	1	1.8	1	2.8	1	4	1	5.6	1	7.1
2	2	2	3.6	2	5.6	2	8	2	11.1	2	14.3
3	3	3	5.4	3	8.3	3	12	3	16.7	3	21.4
4	4	4	7.1	4	11.1	4	16	4	22.2	4	28.6
5	5	5	8.9	5	13.9	5	20	5	27.8	5	35.7
6	6	6	10.7	6	16.7	6	24	6	33.3	6	42.9
7	7	7	12.5	7	19.4	7	28	7	38.9	7	50.0
8	8	8	14.3	8	22.2	8	32	8	44.4	8	57.1
9	9	9	16.1	9	25.0	9	36	9	50.0	9	64.3
10	10	10	17.9	10	27.8	10	40	10	55.6	10	71.4
11	11	11	19.6	11	30.6	11	44	11	61.1	11	78.6
12	12	12	21.4	12	33.3	12	48	12	66.7	12	85.7
13	13	13	23.2	13	36.1	13	52	13	72.2	13	92.9
14	14	14	25.0	14	38.9	14	56	14	77.8	14	100.0
15	15	15	26.8	15	41.7	15	60	15	83.3		
16	16	16	28.6	16	44.4	16	64	16	88.9		
17	17	17	30.4	17	47.2	17	68	17	94.4		
18	18	18	32.1	18	50.0	18	72	18	100.0		
19	19	19	33.9	19	52.8	19	76				
20	20	20	35.7	20	55.6	20	80				
21	21	21	37.5	21	58.3	21	84				

1.5 by 1.5 meter		2 by 2 meter		2.5 by 2.5 meter		3 by 3 meter		3.5 by 3.5 meter		4 by 4 meter	
Count of surviving seedling, sapling	Percent										
22	22	22	39.3	22	61.1	22	88				
23	23	23	41.1	23	63.9	23	92				
24	24	24	42.9	24	66.7	24	96				
25	25	25	44.6	25	69.4	25	100				
26	26	26	46.4	26	72.2						
27	27	27	48.2	27	75.0						
28	28	28	50.0	28	77.8						
29	29	29	51.8	29	80.6						
30	30	30	53.6	30	83.3						
31	31	31	55.4	31	86.1						
32	32	32	57.1	32	88.9						
33	33	33	58.9	33	91.7						
34	34	34	60.7	34	94.4						
35	35	35	62.5	35	97.2						
36	36	36	64.3	36	100.0						
37	37	37	66.1								
38	38	38	67.9								
39	39	39	69.6								
40	40	40	71.4								
41	41	41	73.2								
42	42	42	75.0								
43	43	43	76.8								
44	44	44	78.6								
45	45	45	80.4								

1.5 by 1.5 meter		2 by 2 meter		2.5 by 2.5 meter		3 by 3 meter		3.5 by 3.5 meter		4 by 4 meter	
Count of surviving seedling, sapling	Percent										
46	46	46	82.1								
47	47	47	83.9								
48	48	48	85.7								
49	49	49	87.5								
50	50	50	89.3								
51	51	51	91.1								
52	52	52	92.9								
53	53	53	94.6								
54	54	54	96.4								
55	55	55	98.2								
56	56	56	100.0								
57	57										
58	58										
59	59										
60	60										
61	61										
62	62										
63	63										
64	64										
65	65										
66	66										
67	67										
68	68										
69	69										

1.5 by 1.5 meter		2 by 2 meter		2.5 by 2.5 meter		3 by 3 meter		3.5 by 3.5 meter		4 by 4 meter	
Count of surviving seedling, sapling	Percent										
70	70										
71	71										
72	72										
73	73										
74	74										
75	75										
76	76										
77	77										
78	78										
79	79										
80	80										
81	81										
82	82										
83	83										
84	84										
85	85										
86	86										
87	87										
88	88										
89	89										
90	90										
91	91										
92	92										
93	93										

1.5 by 1.5 meter		2 by 2 meter		2.5 by 2.5 meter		3 by 3 meter		3.5 by 3.5 meter		4 by 4 meter	
Count of surviving seedling, sapling	Percent										
94	94										
95	95										
96	96										
97	97										
98	98										
99	99										
100	100										



**Royal Government of Bhutan**  
**Ministry of Agriculture and Forests**  
**Department of Forests and Park Services**



## **Plantation Journal**

**Social Forestry and Extension Division**  
**Royal Government of Bhutan**

## Plantation Journal

Name of the Plantation: .....

Dzongkhag :.....

Dungkhag:.....

Gewog :.....

Village:.....

Location:.....

Year of Creation.....

**Attach map with boundary details, measurements and reference points:** (Map should be prepared on scale/Google earth/GPS, indicate reference point and should have index)

## **PART A: PLANTATION CREATION**

### **1. INTRODUCTION**

- Location: .....
- Year of creation: .....
- Area: .....Ha: .....Acres

### **2. SITE DESCRIPTION**

#### **2.1. Geographical descriptions**

- 2.1.1. Altitude (m).....
- 2.1.2. Aspect.....
- 2.1.3. Slope (degree).....

#### **2.2. Soil and rainfall**

- 2.2.1. Soil type: .....
- 2.2.2. Soil PH: .....
- 2.2.3. Depth (Hard soil/Soft soil): .....
- 2.2.4. Texture: .....
- 2.2.5. Colour: .....
- 2.2.6. Rainfall (Annual average rainfall in mm).....

#### **2.3. History of the area**

Describe the status of the land before establishment of nursery.







Regeneration of survey records (if there is any regeneration of tree species taking place in the proposed plantation site)

**Types of Plantation (describe whether plantation is)**

Sl. No	Types of plantation	Tick	Description
1	Rehabilitation of fire burnt and landslides areas		
2	Normal Plantation		
3	Reforestation in harvested areas		
4	Wild life habitat enrichment plantation		
5	Urban recreation plantation		
6	Plantation of forest fire resistant species in fire prone areas		
7	Plantation for water shed/ land Management		
8	Non Wood Forest Produce (NWFP) Plantation		
9	River and stream bank protection plantation		
10	Avenue and road side Plantation		
11	Plantation in mining sites		
12	Industrial plantation		
13	Plantation in heritage forest		
14	Compensatory plantation		
15	Enrichment plantation		
16	Commercial Plantation		

### 3. METHOD OF PLANTATION

Describe the method of plantation applied in the particular plantation site. May be one or two of the following methods:

#### 3.1. Direct Seeding

SI. No.	Method of Seeding	Species	Quantity	Remarks
1	Thalis			
2	Line/terraces			
3	Scarification and broadcasting in the entire plantation site			
4	Dibbling			

#### 3.2. Seedling Planting

SI. No.	Method of Seeding	Species	Quantity	Remarks
1	Entire planting (bare root planting, may be wildings or the seedlings raised in nursery)			
2	Planting of poly pot seedlings			
3	Planting of seedlings with ball of earth (in some species it is necessary to transport seedlings with ball of earth to ensure its survival)			
4	Percentage of species mixture			

#### 3.3. Seedling Planting

SI. No.	Method of Seeding	Species	Quantity	Remarks
1	Stump plantation			
2	Rhizomes			

#### **4. DETAILS OF CREATION ACTIVITIES**

##### **Site preparation**

Cutting, Slash and burn (this work is done normally in clear – felled areas)

Alignment and stacking (to maintain correct spacing as prescribed in the estimate/ plan for the area)

Spacing (describe spacing from plant to plant, line to line, pit to pit, thali to thali etc in meters)

Soil work: (as prescribed in the plan/estimate)

**Species wise number of seedlings planted Quantity & quality of seedlings)**

<b>Sl. No.</b>	<b>Type of Seeding</b>	<b>Quantity</b>	<b>Height</b>	<b>Age</b>	<b>poly pot sizes</b>
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					

**Protection work:** (describe the type of protection works) (May be wooden fencing, social fencing, plantation guard deployed, Fire line etc)

## 5. FINANCIAL INPUT

Creation cost: (should include no. of labors, quantity of materials consumed, money spent,

Sl. No.	Items of works	Unit	Quantity	Amount (Nu)	Total Amount (Nu)	Remarks
<b>A</b>	<b>PLANTATION WORKS</b>					
1	Survey of proposed plantation area					
2	Site Clearance. Cutting of bushes. Clearing & burning					
3	Alignment and stacking including. Collection of sticks.					
4	Cost of seedlings					
5	Transportation of seedlings					
6	Digging of pit size 30 cm dia. X 30 cm dia in hard and rocky soil					
7	Planting of seedlings in readymade pits					
8	Sign board making					
9	Fixing sign board					
	<b>Subtotal (A)</b>					
<b>B</b>	<b>FENCING WORKS</b>					

Sl. No.	Items of works	Unit	Quantity	Amount (Nu)	Total Amount (Nu)	Remarks
1	Royalty for fencing post					
2	Cost barbed wire and u-nails					
3	Transportation of barbed wire					
4	Transportation fencing post					
5	Application of preservatives					
6	Pit digging and erection of post					
7	Fixing and stretching of barbed wire including carriage up to working site and putting u nails					
8	Cost of making style (wooden stair case)					
	<b>Subtotal (B)</b>					
<b>C</b>	<b>CREATION OF FIRE LINE</b>					
1	Fire line construction around plantation					
	<b>Subtotal (C)</b>					
	<b>Grand total</b>					

**PART B: MAINTENANCE AND REFILLING (to be started from separate page)**

**1. WEEDING AND CLEANING:**

<b>Activities</b>	<b>Area in hectares</b>	<b>Mandays</b>	<b>Amount (Nu)</b>	<b>Remarks</b>
<b>1<sup>st</sup> Year</b>				
1 <sup>st</sup> weeding				
2 <sup>nd</sup> weeding				
3 <sup>rd</sup> weeding				
<b>2<sup>nd</sup> Year</b>				
1 <sup>st</sup> weeding				
2 <sup>nd</sup> weeding				
3 <sup>rd</sup> weeding				
<b>3<sup>rd</sup> Year</b>				
1 <sup>st</sup> weeding				
2 <sup>nd</sup> weeding				
3 <sup>rd</sup> weeding				
<b>4<sup>th</sup> Year</b>				
1 <sup>st</sup> weeding				
2 <sup>nd</sup> weeding				
3 <sup>rd</sup> weeding				
<b>5<sup>th</sup> Year</b>				
1 <sup>st</sup> weeding				
2 <sup>nd</sup> weeding				
3 <sup>rd</sup> weeding				
<b>Grand Total</b>				

**2. REFILLING**

- a. Percentage of area taken up .....
- b. Number of seedling replaced.....
- c. No. of mandays:.....Nu.....

**3. FENCING REPAIR**

- c. No. of fencing post replaced:..... Percentage.....
- d. Cost of fencing post:.....
- c. No. of mandays ..... Nu.....
- d. Others.....

**4. Plantation Guards**

- a. No of months .....Nu..... (for large scale  
plantation only and not for small scale plantation)







**Royal Government of Bhutan**  
**Ministry of Agriculture and Forests**  
**Department of Forests and Park Services**



## **Nursery Journal**

**Social Forestry and Extension Division**  
**Royal Government of Bhutan**

# Nursery Journal

Name of the Nursery: .....

Dzongkhag: .....

Dungkhag: .....

Gewog: .....

Village: .....

Location: .....

Year of Creation: .....

**Attach map with boundary details, measurements and reference points:** (Map should be prepared on scale/Google earth/GPS, indicate reference point and should have index)

## **PART A: NURSERY CREATION**

### **1. INTRODUCTION**

- Location.....
- Year of creation.....
- Area of creation.....Ha.....Acres

### **2. SITE DESCRIPTION**

#### **2.1.Geographical descriptions**

- 2.1.1 Altitude (m).....
- 2.1.2 Aspect.....
- 2.1.3 Slope (degree).....

#### **2.2.Soil and rainfall**

- 2.2.1. Soil type: .....
- 2.2.2. Soil PH: .....
- 2.2.3. Depth (Hard soil/Soft soil): .....
- 2.2.4. Texture: .....
- 2.2.5. Color: .....
- 2.2.6. Rainfall (Annual average rainfall in mm).....

### **3. History of the area**

Describe the status of the land before establishment of nursery.



#### 4. TYPES OF NURSERY

Sl. No.	Types of Nursery	Tick ( <input type="checkbox"/> )
1	Permanent	
2	Temporary	

#### 5. OBJECTIVES OF NURSERY

- a. To raise seedling for plantation
- b. To raise flower seedling
- c. To raise ornamental seedling
- d. To raise medicinal/aromatic seedling
- e. Others (if any):

#### 6. BEDS CONSTRUCTION

Types of Bed	No. of Beds	No. of Raised/ Sunken Beds	Edging (Stone/ Bricks/ Bamboo post)
Full Bed			
Half Bed			
Quarter Bed			

#### 7. SHED CONSTRUCTION

Total shed construction	Roofing (Bamboo mat/ green net/ grass thatch)	Poles (GI pipe/bamboo post/ wooden post)	Remarks















## 9. FINANCIAL INPUT

Nursery Creation cost: (should include number of labours, quantity of materials consumed, money spent, etc)

Sl. No.	Items of works	Unit	Quantity	Amount (Nu)	Total Amount (Nu)	Remarks
<b>A</b>	<b>NURSERY WORKS</b>					
1	Soil works					
2	Leveling and dressing of bed					
3	Manure, sand and soil					
4	Nursery shed construction					
5	Poly pot works and seed sowing					
6	Watering, weeding and spraying bio pesticide					
	<b>Subtotal (A)</b>					
<b>B</b>	<b>FENCING WORKS</b>					
1	Royalty for fencing posts					
2	Cost barbed wire and u-nails					
3	Transportation of barbed wire					
4	Transportation fencing posts					
5	Application of preservatives					
6	Pit digging and erection of posts					
7	Fixing and stretching of barbed wire including carriage up to working site and putting u nails					

Sl. No.	Items of works	Unit	Quantity	Amount (Nu)	Total Amount (Nu)	Remarks
8	Cost of making style (wooden stair case)					
	<b>Subtotal (B)</b>					
<b>C</b>	<b>CREATION OF FIRE LINE</b>					
1	Fire line construction around plantation					
	<b>Subtotal (C)</b>					
	<b>Grand total</b>					







