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Vietnam Administration of Forestry
Dien Bien Provincial People's Committee

Socialist Republic of Vietnam
Project for Sustainable Forest Management in the Northwest Watershed (Capacity Development of Forest Monitoring)

Final Report

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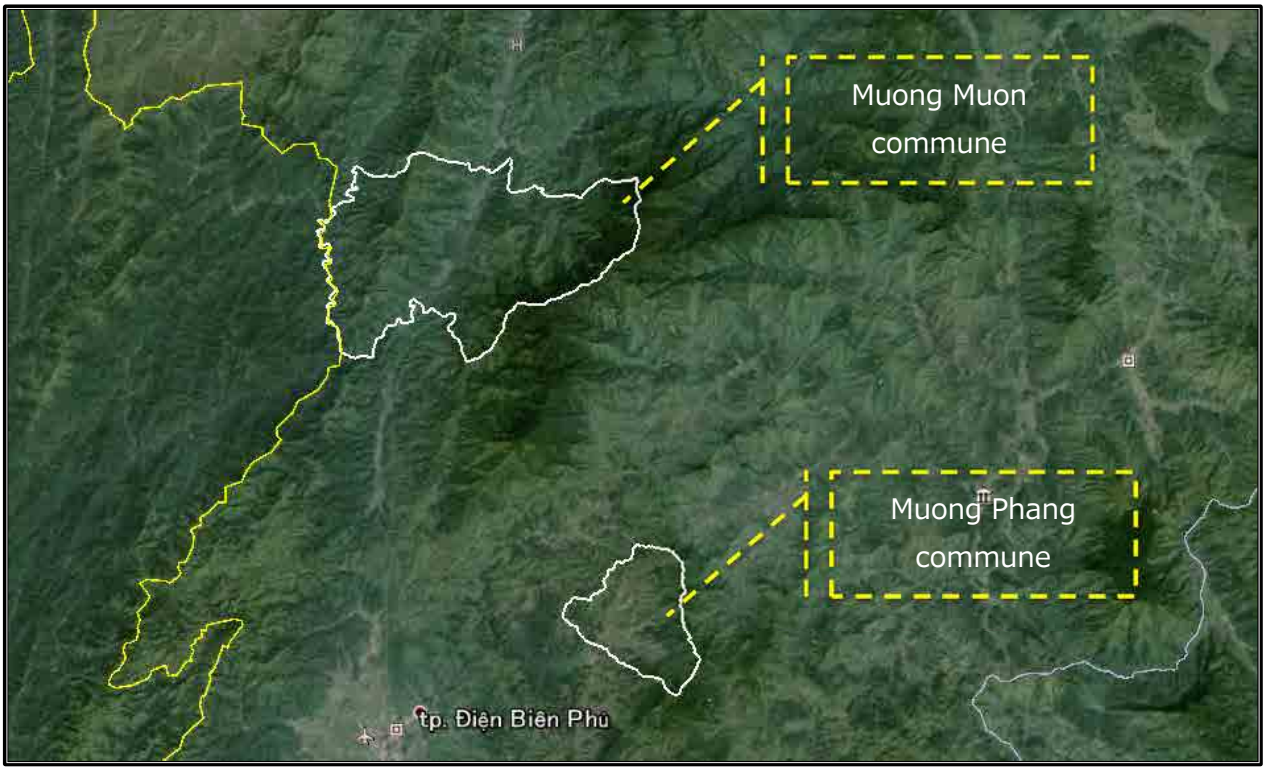

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Abbreviation

CPC	Commune People's Committee
C-RAP	Commune REDD+ Action Plan
DARD	Department of Agriculture and Rural Development
DB	Data Base
FAO	Food and Agriculture Organization of the United Nations
FCMR	Forest Change Measurement and Reporting
FIPI	Forest Inventory and Planning Institute
FMB	Forest Management Board
FMS	Forest Monitoring System
FORMIS	Development of Management Information System for the Forestry Sector in Viet Nam
FPD	Forest Protection Department/Division
FR	Forest Ranger
FRELs/FRLs	Forest Reference Emission Levels/ Forest Reference Levels
FRMS	Forest Resource Monitoring System
GIS	Geographic Information System
GPS	Global Positioning System
IT	Information Technology
MARD	Ministry of Agriculture and Rural Development
MM	Muong Muon commune
MP	Muong Phang commune
NFI&S	National Forest Inventory and Statistics
NFMS	National Forest Monitoring System
NRAP	National REDD Action Program
NRSC	National Remote Sensing Center
OJT	On-the-Job Training

PaMs	Policies and Measures
PC	Personal Computer
PFES	Payment for Forest Environmental Services
PFM-DB	Provincial Forest Monitoring Database
PFMS	Provincial Forest Monitoring System
PPC	Provincial People's Committee
PRAP	Provincial REDD+ Action Plan
QA/QC	Quality Assurance/Quality Control
Q-GIS	Quantum GIS
REDD+	Reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries
REDD+PP	REDD+ Pilot Project
Sub-DOF	Sub-Department of Forest
Sub-FPD	Sub-Department of Forest Protection
SUSFORM-NOW	Sustainable Forest Management in the Northwest Watershed Area
TF	Task Force
UNFCCC	United Nations Framework Convention on Climate Change
VAFS	Vietnam Academy of Forest and Science
VFD	Vietnam Forests and Deltas program
VFPT	Village-based Forest Patrolling Team
VND	Vietnam Dong
VNFOREST	Vietnam Administration of Forestry

Chapter- Ⅰ Overall view of the project

1. Background

Dien Bien Province is a province with a high poverty rate in Vietnam and, at the same time, an important reservoir area that has the Hoa Binh Dam and the Son La Dam. The Vietnamese government regards the province as a region which should have its watershed conservation function fulfilled, including it in its program of Payments for Forest Environment Services (PFES). However, the poverty issues have remained unsolved, and allocation or leasing of forests to households, as well as reallocation to villages, is not quite advanced as of yet. Under such circumstances, JICA launched **the Project for Sustainable Forest Management in the Northwest Watershed Area (hereinafter called "SUSFORM-NOW")** in August 2010, the higher-ranked part of this Project, which is scheduled to end in August 2015.

Vietnam, on the other hand, has been actively committed to international action for climate change called Reduce Emission from Deforestation and Forest Degradation in Developing Countries (hereinafter called "REDD+") and, in 2012, formulated a National REDD+ Action Program (hereinafter called "NRAP"). The NRAP promotes the formulation of provincial REDD+ Action Plans (hereinafter called "PRAPs") to translate the objectives of the NRAP into reality, so Dien Bien Province, with the support of JICA, formulated a "Dien Bien Province REDD+ Pilot Project" (hereinafter called "REDD+PP"), under which a PRAP and Commune REDD+ Action Plan (hereinafter called "C-RAP") were formulated. These plans set forth the policy to be committed to REDD+ while taking advantage of the existing policies, and they give a detailed account of human resources policies, reorganization of policies, financial considerations, and specific measures to be taken. Among these specific statements, monitoring of forest protection is particularly highlighted as one of the mainstays of REDD+ activities. At the same time, REDD+PP adopted a database of information about forest monitoring activities for the central management of information.

SUSFORM-NOW took over these REDD+PP achievements and agreed in the interim review report prepared in January 2013 to undertake forest monitoring and other activities.

Under the background stated above, **the Project for Sustainable Forest Management in the Northwest Watershed Area (Capacity Development for Forest Monitoring) (hereinafter called "PFMS-CD")** will be implemented for the purpose of enhancing the capacity of the government in relation to the provincial forest monitoring system and forest information database, both of which will serve as the mainstays of the PRAP and C-RAP.

2. Principal concept of PFMS-CD implementation

Issues remaining unsolved under REDD+PP, the preceding project, can be summarized into the following four aspects:

- **Strengthening of project ownership**
- **Capacity development through OJT**
- **Propose feasible mechanisms**
- **Contribution to the Central level and other donors**

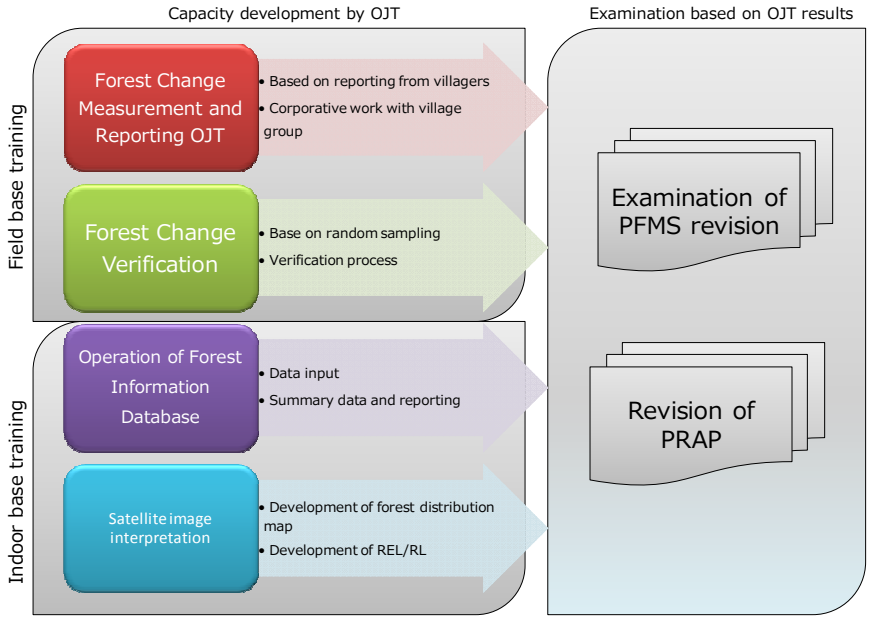

Figure 1 Structure of capacity development and output

Taking into consideration these challenges, the principal concepts of PFMS-CD project implementation are mentioned as in the following four points. It consists of operational aspects and technical aspects, and this entire concept is arranged in line with follow-up challenges and knowledge which was raised from REDD+PP.

PFMS-CD technically intends to focus on on-the-job training (OJT) of data collection through the actual operation of PFMS and to ensure that trainees will improve their practical capacities, while the preceding project chiefly provided lecture-based training. It will also sort out knowledge and possible issues to be clarified through OJT, verify the feasibility of PFMS designed under PRAP, examine the cost effectiveness and revise PFMS, if necessary. In particular, C/P officers are expected to have problem awareness and discuss the feasibility of the project themselves by participating in surveys.

As for management, PFMS-CD will prompt the organizations concerned to demonstrate their own ownership, have discussions with the central government and other donors, and strengthen the partnership with these parties.

3. Specific activities of the PFMS-CD project

Taking the shape of each component which is mentioned above, it is assumed that seven activities are carried out.

1. **Planning and operation of capacity development about provincial forest monitoring.**
2. **Operation and managing the forest information database. Revision of specifications and adjustment for the national database.**
3. **Support provincial forest monitoring and examine challenges of the system for revision.**
4. **Satellite image analysis and identification of the forest status.**
5. **Revision of FRELs/FRLs**
6. **Development of technical guidelines and revision of PRAP**
7. **Operate activities through 1 to 6 as mentioned above. Communicate to national authorities and other international donors**

Principal concepts of capacity development shall be conducted through on-the-job training. Therefore, the activities of 1 and part of 3 shall be integrated. In addition, principal concepts of project management indicate the importance of task force[1] activities, and clarifications of task force activities are indispensable. Communication and information sharing with central authorities and other international donors is also an important issue to be handled.

Based on this, the above mentioned components from 1 to 7 could be broken down into more detailed activities as shown in the following:

[1] TF is a group that consists of officials from the various implementing agencies of PFMS, mainly FPD at different levels, to steer the piloting the experience learnt. The TF has organized monthly meetings to discuss various PFMS operation issues.

Table 1　OJT components and detailed activities

Components	Activities	Target
1．PFMS training through OJT and data collection		
1-1　Forest Change Measurement and Reporting OJT	Based on villagers' reporting and data collection	Commune District
1-2　Forest Change Verification	Based on random sampling and data collection	Commune District TF
2．Forest Information Database management and operation		
2-1　Data input	Input data of activities 1-1 and 1-2 mentioned above	District
2-2　DB management	Debugging of the database and revision of DB specifications	District、TF
3．Examination of revised PFMS		
3-1　Reviewing PFMS	Point out challenges of PFMS and examine improvement and revisions of PFMS	TF
4．Satellite image analysis		
4-1　Training of satellite image interpretation	Central level training	TF
4-2　Conduct satellite image interpretation	Interpret satellite image (year of 2015)	TF
5．Revision of FRELs/FRLs		
5-1　Training of FRELs/FRLs development	Understanding of FRELs/FRLs concept	TF
5-2　Revision of FRELs/FRLs	Applying actual data and developing FRELs/FRLs	TF
6．Revision of relevant guidelines		
6-1　Revision of PFMS guidelines	Based on the result of activity 3.	TF
6-2　Revision of the DB operation manual	Based on the result of activity 2.	TF
6-3　Development of the FRELs/FRLs manual	Based on the result of activity 5.	TF

Components	Activities	Target
6-4 Support for PRAP and C-RAP revision	Based on the result of activity 2 and 3.	TF

7． Project management and meeting organization

7-1 Consultation about the inception report and kick-off meeting	Launching a task force and planning training contents and schedule.	TF
7-2 Progress WS	Arrangement and reporting of monthly monitoring results	TF
7-3 Final WS (Hanoi)	Information sharing with central authorities	TF
7-4 Final WS (Dien Bien)	Information sharing to relevant institutions among Dien Bien province	TF
7-5 Cooperation with VNFOREST	Knowledge sharing about forest monitoring	TF
7-6 Cooperation with FORMIS Ⅱ	Knowledge sharing about central level database specifications	TF
7-7 Operating TF meeting	Operating and managing the project	TF

The following figure indicates the process flow of the project. Activities are divided into two major components.

- Data collection through OJT activities
- Database management and satellite image analysis for FRELs/FRLs development

Forest monitoring based on villagers' reporting and forest monitoring based on random sampling are major OJT activities. Forest monitoring training is planned to be conducted for two weeks including field surveys, data input and the summarization process.

It shall start from September 2014 under supervision from experts, and is planned to be conducted four times every second month. At the end of the project period, collected knowledge and challenges are integrated for revision of PFMS and improvement of PRAP and C-RAP.

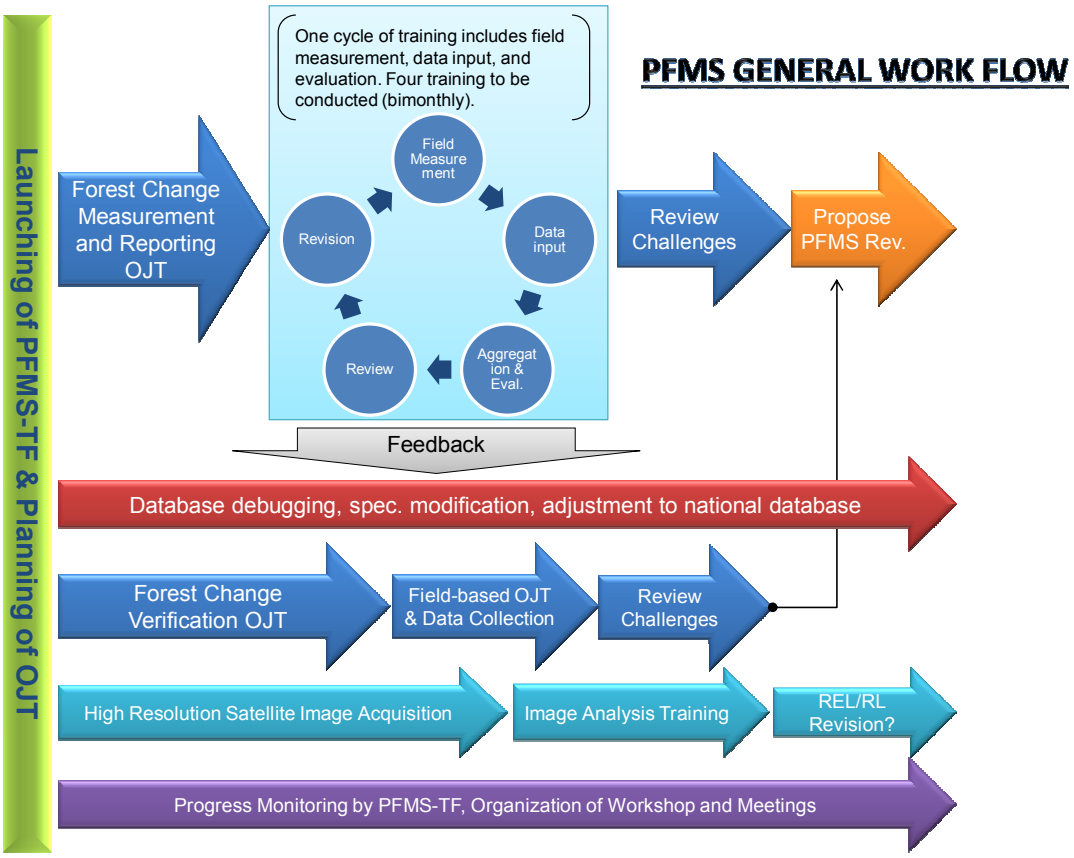

Figure 2 Work flow

Chapter-Ⅱ Results of the project

1. Improvement of PFMS

1.1. Improved items and overall structure of PFMS

The existing design of PFMS presented in PRAP of Dien Bien Province has been revised to incorporate the following suggested improvements.

Table 2 Improved items of PFMS

Item to be revised	Current design	Revised design
Revision of institutional arrangement	Major institute of implementation is Sub-DOF	Sub-FPD is the major institution of FCM and it needs to centralize. Taking shape of this, we established a Task Force.
Clarification of institutional arrangement	Existing forest monitoring system is the basis of the structure.	Clarify TF members to operate PFMS and centralize to check the VFPT report and evaluate FCM results.
Clarification of institutional arrangement	FR is the key player in collaborative work with villagers.	Clarify the involvement of villagers. We established VFPT and developed reporting format, reporting frequency and made it function.
Automation of input system by FR	Field monitoring by GPS, compass, and paper-based field notes.	Introduce a Tablet PC input system to avoid mistyping and integration of measurement tools.
Revision of database design	Introduce ArcGIS and Access but no connection with the central system	Collect all information to cover the requirements of the central level and harmonize the operation system. As a result, Q-GIS and Postgre-SQL are introduced as a core platform.

The following figure illustrates the entire structure of the revised PFMS, which consists of four levels: that is, Province, Districts, Communes and forest owners.

As for actual forest change monitoring, when a forest owner reports on any forest change, forest rangers check the site and perform measurement surveys. Data collected will be accumulated at District-FPD through an integrated data collection system using tablet PCs.

Next, District-FPD creates a polygon for the forest change concerned, and reports to the provincial level. Then data confirmation and quality control are performed, and after obtaining approval for the data at PPC, it will be submitted to the central government.

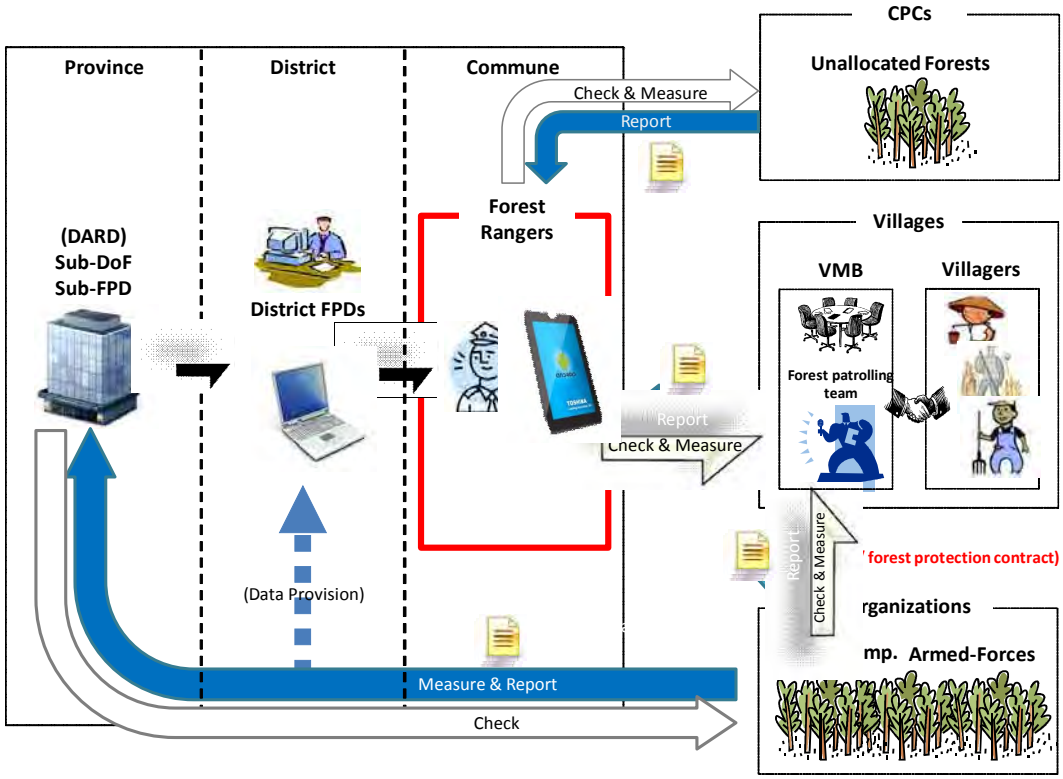

Figure 3 Overall structure of the revised PFSM

1.2. Development of tablet software and a database system

Alongside the revisions to PFMS, field survey software has been developed, which is operable on tablet PCs that have the following functions

- Android Operation System, version 4.0 and higher
- Screen size: 5 inches or larger
- Back-side built-in camera
- GPS receiving sensor (GLONASS GPS).
- Digital compass sensor (True North or Magnetic North)
- Wireless internet connection (Wi-Fi)

Significant features of the software development are:

- ☑ The GPS function can measure the forest change area, leading to highly transparent data collection.
- ☑ The compass function with a digital camera can indicate trails of on-site situations.
- ☑ The software, equipped with digital field notes, can reduce input errors, leading to highly precise data collection.
- ☑ The Wi-Fi function can automatically register data collected in a database. This will help prevent reporting errors.
- ☑ The automatic function covering inputting, reporting and other tasks can reduce operators' workload.
- ☑ The all-in-one function, including a digital camera and compass, can produce higher cost effectiveness compared to a system for which each component needs to be purchased individually.

Data collected is managed in an integrated manner through the software, and a database for reporting to the central government has been developed, which is put on a data server installed in the province.

The database uses QGIS 2.8, Postgre-SQL 9.4 and PostGIS 2.2 as basic software to develop necessary input/output functions.

1.3. Introduction of the QA/QC process

QA/QC is a new activity since the concept of QAQC was not conceptualized previous PFMS. Improved PFMS has two different processes for QA/QC. One is applying satellite imagery under the process of forest change monitoring to control quality of forest base map. The other is verifying accuracy of forest base map to assure quality of it.

To achieving this QA/QC processes, capacity building for satellite image interpretation and training for Q-GIS operation to random sampling has been implemented.

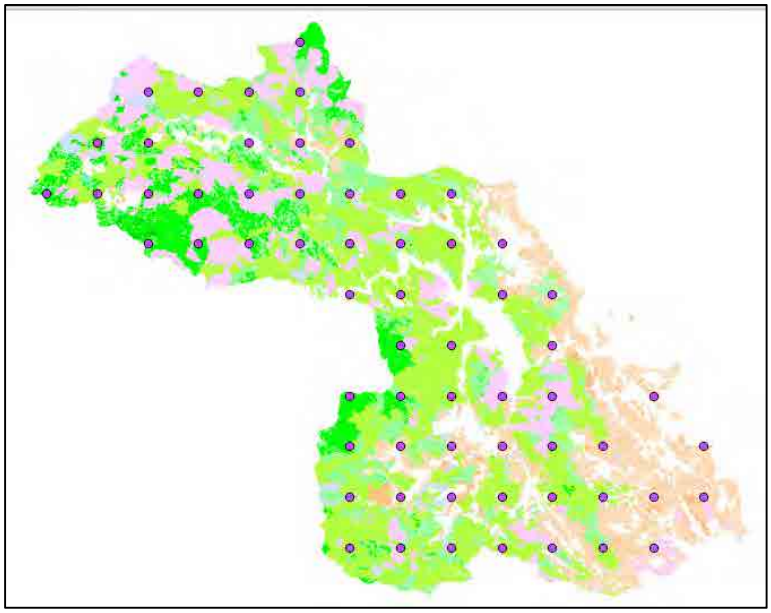

Figure 4 Generation of sampling point by Q-GIS

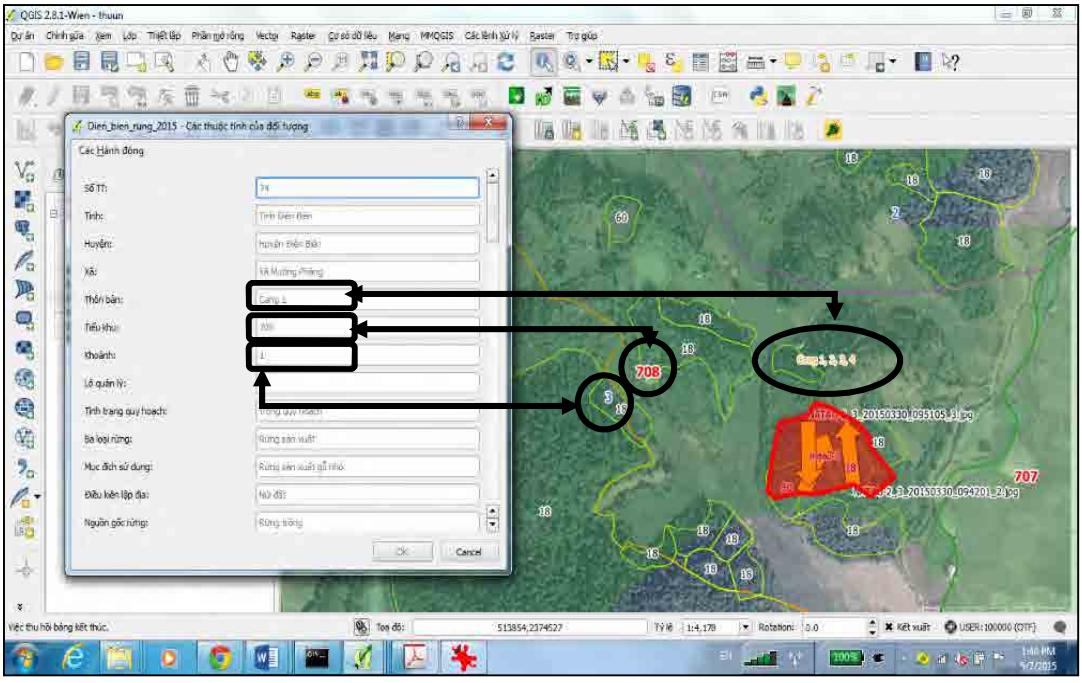

Figure 5 Screen shot of PFM-DB operation

1.4. Development of a guidebook, handbook and operation manuals

Based on the overall design of PFMS, a necessary handbook, guidebook and operation manuals are developed. The handbook indicates the overall structure of PFMS and generally explains each step for the operation of activities. The operation manual also describes the operation of tablet software and the operation of the database in detail.

Tablet 3 shows the objectives and subject reader of the manual.

Table 3 Developed manuals and objectives

Title of documents	Objectives / contents	Target
PFMS implementation handbook	Understand the overall structure of PFMS and the necessary action to be taken.	Central policy maker PFMS piloting institute
PFMS implementation guidebook	Understand the overall schedule and cost of operation for smooth implementation.	Administrator of PFMS in the provincial level
Village-based forest patrolling (VFP) implementation guidebook	Detailed operation of VFPT	VFPT members
Forest change measurement and reporting (FCMR) implementation guidebook	General understanding and procedure of FCMR	People in charge of FCMR operation and/or field surveyors
Operation manual of tablet software	Tablet-software operation (Hands-on manual)	FCMR field surveyors
Database management guidebook (for District FPDs)	General understanding of PFM-DB management (in the District-FPDs level)	People in charge of District-FPDs and/or database operators
Operation manual of the Provincial Forest Monitoring Database (PFM-DB) for District FPDs	Database operation in District-FPDs (Hands-on manual)	Database operators in District-FPDs
Database management guidebook (for Sub-FPD)	General understanding of PFM-DB management (in the Sub-FPD level)	People in charge of Sub-FPD and/or database operators
Operation manual of the Provincial Forest Monitoring Database (PFM-DB) for Sub-FPDs	Database operation in Sub-FPD (Hands-on manual)	Database operators in Sub-FPD
Operation manual of QA/QC (verification with satellite images)	General understanding of QA/QC (satellite) and detailed operation	PFMS administrators in the provincial level

Title of documents	Objectives / contents	Target
Operation manual of QA/QC (verification with random sampling)	General understanding of QA/QC (random sampling) and detailed operation	PFMS administrators in the provincial level

1.5. Cost analysis of improved PFMS

When it comes to PFMS revision, not only consideration of securing reliability and transparency of data collection, but also high cost efficiency shall be taken into consideration for sustainability of the system. Therefore, cost analysis has been done to compare conventional methodology and other methodology. In cost analysis, data reliability and characteristics of collected data was also compared. The methods below were compared.

Method-1: Current method: Used a paper-based survey and did not archive geographical information. Due to the lack of evidence, there is high uncertainty in the annual report.

Method-2 : Advanced method:: Field notes are still paper-based. Field photos were taken by digital camera and field measurement was taken by GPS respectively. However, how to update forest status map is unclear

Method-3 : Innovative method: Digital field notes, compass, GPS and a digital camera are equipped in one tablet PC. Digitalized input/update system in order to reduce workload.

Table 4 Cost analysis of different PFMS methodology

	Method-1	Method-2	Method-3
Evidence (Geographical data)	Not collected	Collect by individual GPS	Collect by tablet PC
Evidence (Filed photo)	Mostly not collected	Collected by individual digital camera	Collect by tablet PC
Data credibility	Very low	High (field note input is low)	Very high
Equipment to be used	Paper based field notes	Compass, GPS, Digital camera, SD card. Paper based field notes	Tablet PC (all –in –one)
Cost of equipment	No cost	10-15 million/ Forest ranger	Tablet PC: 4 million/Forest ranger Server PCr:70 million/Sub-FPD
Work day for data arrangement	1 - 2 days/one forest change area	Not available (such a system has not been developed)	1 - 2 hours /one forest change area
Replicability	High (Current system)	Low (due to costly system)	It seems to be high (Already examined in DB province).

2. Capacity development for FCMR

Forest change measurement and reporting is a major activity in PFMS in terms of the field confirmation process. Tablet PC systems which were developed under this project were used for field measurement, and these operation training sessions were conducted in the name of OJT.

Forest rangers are mostly the subject of this training, and one week of training per month has been conducted to emphasize training effectivity. Table 5 shows the results of FCMR training

Table 5 Results of FCM training

Training period	Participants	Major results
September 15 - 18, 2014	8	Cycle 1: Forest change measurement and reporting using GPS, GPS-camera, paper-based satellite map and paper-based field notes.
September 22 - 26, 2014	13	
November 10 - 13, 2014	7	Cycle 2: Forest change measurement and reporting using GPS, GPS-camera, paper-based satellite map and paper-based field notes; Testing tablet-based software for forest change measurement and reporting.
November 24 - 27, 2014	13	
January 7 - 12, 2015	7	Cycle 3: Forest change measurement and reporting using tablet-based software
January 13 - 16, 2015	12	
March 23 - 26, 2015	6	Cycle 4: Forest change measurement and reporting using tablet-based software
March 27 - April 1, 2015	11	

Through this FCMR OJT, forest rangers obtain the ability to operate forest change measurement and report results to higher level.

3. Capacity development for database management

Subsection 1.2 shows the results of database developments. Based on this database, training for data collection, edit and the approval process was conducted. There are two different types of training courses. One is subject to the district level and the other is subject to the provincial level. Table 6 and 7 shows the results of the training.

Table 6 Results of training for Database management (District level)

Training period	Participants	Major results
September 19, 2014	8	Cycle 1: Data input and (stand-alone) database management at the district level for both Dien Bien and Muong Cha Dist-FPDs.
January 20 - 21, 2015	14	Cycle 2: PFM-DB management for Dist-FPD on the provincial centralized database
April 02 - 03, 2015	16	Cycle 3: PFM-DB management for Dist-FPD on the provincial centralized database.
May 25 - 26, 2015	14	Cycle 4: PFM-DB management for Dist-FPD on the provincial centralized database.

Table 7 Results of training for Database management (Province level)

Training period	Participants	Major results
April 06 - 08, 2015	11	Cycle 1: PFM-DB management for Sub-FPD on the provincial centralized database.
May 27 - 28, 2015	12	Cycle 2: PFM-DB management for Sub-FPD on the provincial centralized database

Major challenges of the database operation are the way forward to database revision to secure harmonization with the national forest monitoring system.

4. Capacity development for QA/QC

Subsection 1.3 describes the methodology of QA/QC, and it has two options. One is a satellite-based approach to assure data quality. The other is a random sampling-based approach to control data quality. Based on these methodologies, the relevant training was conducted.

Table 8 Results of QA/QC training

Training period	Participants	Contents
May 18 - 22, 2015	16	Training on interpretation of Landsat-8 satellite images for the QA/QC process
April 13 - 16, 2015	16	Training on the verification process with random sampling-based plots.

For training on interpretation of satellite images, this required high expertise so that this training period was not enough to build capacity for interpretation.

For training on verification, a different method of the sampling process is proposed and further training is necessary.

5. TF meeting operation

One of the major objectives of this project was how to promote project ownership. To take the shape of this, the launching of a TF group and organization of a TF meeting on a monthly basis was implemented. Table 9 shows the results of the TF meetings.

Table 9 List of TF meetings

Name	Date	Participants	Major topic
PFMS Kick-off meeting	July 16, 2014	17	Establishment of a PFMS Task Force; Identification of OJT participants at 3 levels.
PFMS Kick-off workshop	July 30, 2014 (PM)	--	Introduction of improved PFMS; PFMS OJT Planning.
2nd PFMS-TF monthly meeting	August 26, 2014	19	Summarize Village-based Forest Patrolling team activity; Introduction of the draft field notes for forest rangers; Planning for 1st field FCMR.
3rd PFMS-TF monthly meeting	September 29, 2014	22	Report on 1st cycle OJT; Introduction of tablet-based field data collection software ideas.
4th PFMS-TF monthly meeting	October 29, 2014	15	Introduction of revised Field Notes (paper-based) and introduction of newly designed Tablet-based digital field notes; Recommendations for converting the prototype PFMS to an NFMS-based PFMS.
5th PFMS-TF monthly meeting	November 28, 2014	25	Report on the 2nd cycle of FCM OJT on field data collection, shortcomings and recommendations; Issues and progress of data input and database

Name	Date	Participants	Major topic
			management of PFMS – looking forward to central level feedback.
6th PFMS-TF monthly meeting	January 06, 2015	21	Introduction of version 1.0 of tablet-based field data collection software.
7th PFMS-TF monthly meeting	January 28, 2015	23	Report on the 3rd cycle of FCM OJT on field measurement using a tablet-based field survey application and OJT on data manipulation at the district level: Achievements, shortcomings and recommendations.
8th PFMS-TF monthly meeting	February 27, 2015	19	Progress of development of the PFMS database.
9th PFMS-TF monthly meeting	March 28, 2015	16	Summarized work of the consultant team in March 2015 (results and shortcomings).
10th PFMS-TF monthly meeting	April 17, 2015	21	Report on PFMS OJT activities; Finalizing the PFMS database; Introduction and finalization of the Verification System.
11th PFMS-TF monthly meeting	May 29, 2015	22	Finalizing the PFMS database; Suggestion on operation of PFMS with the supervision of experts and consultants.
12th PFMS-TF monthly meeting	July 2, 2015	22	Short presentation of finalized user manuals for all 3 levels; PFMS Replication plan of Dien Bien province
Last PFMS-TF monthly meeting	July 25, 2015	22	PFMS Wrap-up

A total of 13 TF meetings were conducted. TF members could also develop monthly plans by themselves and check the status of PFMS. In addition to this, TF members could identify the challenges of PFMS and propose countermeasures by themselves. In conclusion, through the operation of TF meetings, project ownership was highly promoted.

6. Coordination with the central government and other donors

Coordination with relevant institutions and other projects is also a key issue in this project. In particular, development of FREL/FRL by FAO and development of a national forest information database by FORMIS are important tasks.

Table 10 Consultation with VNFOREST and other donors

Meetings	Date / Venue	Participating organizations	Major topics
FREL/FRL PFMS/MRV COORDINATION MEETING	April 10, 2015 at JICA Vietnam Office	SUSFORM-NOW, VFD, FIPI, FAO (NFA), VAFS	National level REL/RL development - Sub-national level REL/RL development - PFMS/MRV Session
INTEGRATION OF PFMS AND FRMS	July 10, 2015 at FORMIS office	SUSFORM-NOW, FORMIS	- On the harmonization of PFMS and FRMS
VNFOREST CONSULTATION MEETING	July 10, 2015 at VNFOREST	VNFOREST, SUSFORM-NOW, FORMIS	- Proposal for harmonization with FORMIS and JICA

Coordination with FORMIS II has been successfully done and further work roads shall be clarified. A major topic is how to integrate PFMS into the national forest information system.

7. Other activities

7.1. Forest area change analysis by high-resolution satellite image

Satellite images are used for two objectives. One is to evaluate the SUSFORM-NOW activity by interpreting high-resolution satellite images. The other is to gather supplementary information to support forest-monitoring activity such as QA/QC by interpreting satellite images taken by VNREDSat. Observation of both types of images has been requested from January 2015.

7.1.1. Observation by the Pleiades satellite

We started observation from January 1, 2015 and succeeded in capturing clear images on January 29. Image interpretation for new images and comparison of existing forest distribution maps is planned for the next steps for evaluation of deforestation and forest recovery.

Figure 6 Pleiades image of the MM commune

7.1.2. Observation by VNREDSat satellite and results

This satellite is managed by NRSC (the Department of National Remote Sensing) under MONRE. An official request letter from DARD could raise the priority of observation, and PFMS-CD is prepared to respond to this. Observation will start from the end of February and PFMS-CD is waiting for completion. As for the results, VNREDSat could not obtain cloud-free (10% or less cloud cover) images.

Figure 7 Pleiades image of the MP commune

7.1.3. Results of the forest area change analysis

Table 11 and 12 shows the results of forest area change analysis based on a high resolution satellite.

Table 11 Forest area change in Muong Phang commune from 2013 to 2015 (Unit:ha)

(MP)	(ha)	Banh	Bua	Cang 1, 2, 3, 4	Che Can, Co Kho	Co Liu	Co Luong	Co Man 1, 2	Kha	Khau Cam	Long Hay	Long Luong 1, 2	Long Nghiu	Phang 1, 2, 3	Tan Binh	Yen 1, 2, 3	Total
Deforested	IIIa1 -->NR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	1.8	0.0	0.0	2.0
	IIa -->NR	0.0	0.0	0.0	1.3	0.0	0.3	0.0	0.8	0.0	0.0	1.6	1.9	7.4	0.0	0.0	13.3
	IIb -->NR	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.6	1.4	1.1	0.0	0.2	5.3
	IIb -->RD	0.0	4.5	0.0	0.0	2.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.7
Subtotal		0.0	4.5	0.4	1.3	2.0	0.3	2.2	0.8	0.0	1.6	2.4	3.3	10.3	0.0	0.2	29.3

[Legend]

IIIa1:Timber forest – poor, IIa:Timber forest – regrowth, IIb:Timber forest – degraded, NR:Upland fields, RD:Rubber plantation

Table 12 Forest area change in Muong Muon commune from 2013 to 2015 (Unit:ha)

	(ha)	Don bien phong	Huoi Ho	Huoi Meo	Huoi Vang	Ket Tinh	Khu vuc tranh chap	Muong Muon 1	Muong Muon 2	Pu Cha - Huoi Nha	Pu Mua	Pung Giat 1	Pung Giat 2	Total
Deforestation	Hill Cult.	0.9	12.1	34.7	2.5	32.1	5.0	10.4	8.6	73.1	39.7	4.2	35.3	258.5
	Paddy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.4
	Fish Pond	0.0	0.0	0.1	0.0	0.7	0.0	0.0	0.1	0.0	0.0	0.0	0.3	1.2
	Rubber	0.0	0.0	0.0	1.8	0.0	0.0	8.1	0.0	0.0	0.0	0.0	0.0	9.9
	Landslide				0.5									0.5
Total		0.9	12.1	34.8	4.7	32.8	5.0	18.5	8.6	73.5	39.7	4.2	35.5	270.4

7.2. Revision of FREL/FRL

Under present circumstances, submission of FRELs/FRLs to UNFCCC is being prepared by MARD. The results of the previous JICA project "The Study on Potential Forests and Land related to 'Climate Change and Forests' in Vietnam" have greatly contributed to these preparations. However, the final judgment of methodology will be done politically and through knowledge-sharing. Advice from SUSFORM-NOW may be indispensable. Therefore, PFMS-CD was provided with comments when the draft FRELs/FRLs was circulated.

On the other hand, it is premature to conduct capacity development for FRELs/FRLs before the methodology at the central level is considered more fully. Therefore, knowledge-sharing and comments for the development of the FRELs/FRLs at the central level shall be major activities. Until those activities are carried out, the revision of the FRELs/FRLs is postponed

7.3. Revision of PRAP

The Current PRAP was drastically revised. Due to this, the need for relevant subsection revisions has been proposed. On the other hand, a revised PFMS system which utilizes a tablet PC system is not officially approved. Therefore, detailed explanation of the system shall be avoided.

A proposed PRAP revision was attached in Annex 1.

7.4. Organize a technical workshop

In addition to knowledge sharing within province, information sharing and discussion with other provinces/donors is also an important activity. To achieve these objectives, three technical workshops were conducted.

In the second technical workshop in particular, a field study tour using a tablet PC system was operated with the participation of other provinces and other donors.

Table 13 Record of technical workshops

1st WS	July 16, 2014	Kick-off workshop. Information sharing on the overall structure of PFMS
2nd WS	January 23, 2015	Proposed idea for PFMS revision. Study tour for tablet PC system utilization
3rd WS	July 30-31, 2015	Reporting project results. Discussion about the way forward

7.5. Feasibility check under other provinces

To checking feasibility of improved PFMS under different condition of nature and divers of current capacity in different province, preliminary training has been done in Thanh Hoa province and Nghe An province.

Specifically, forest change monitoring and reporting process by tablet-PC system was introduced and conducted initial field training.

As a result, high replicability has identified based-on evaluation of initial training.

Chapter-III Challenges and lessons through project operation

1. Use of TF

As a basic policy for this Project, it was targeted to have the Vietnamese government demonstrate its ownership. To achieve this, a TF comprising of representatives of concerned organizations was established and TF meetings were held around the end of each month.

At the TF meetings, members discussed a wide range of topics, including a shortage of equipment and need to improve reporting methods. These discussions appear to gradually foster ownership. An achievement is that TF members are now capable enough to be sent as lecturers to the initial PFMS training in other provinces.

It has been found that the establishment of a concrete task force to create regular chances for discussion, checking activities during the month and confirming those in the subsequent month has resulted in demonstration of ownership.

2. Contribution to the central government and relevant projects

The environment affecting forest information in Vietnam changes from day to day, and may change substantially and suddenly. Meanwhile, UN-REDD, FCPF, giz, SNV, US-AID and various other international cooperation agencies are committed to the field of forest information in the country. Under such circumstances, unless we closely work together with these agencies, we will not be able to widely diffuse knowledge gained through JICA projects. In this sense, it has been reaffirmed that promoting the understanding of JICA projects is a key to greater contribution to the country.

To this end, more specifically, it is important to widely and accurately understand the actions of the central government, support various consultations and heighten the presence of JICA projects.

3. Securing the flexibility of projects

When this Project was launched, neither to develop the field survey software nor to replicate the activities in other provinces was intended. However, it was found the necessity to engage in these out-of-scope activities as a continuation of the close partnership with the relevant projects described above.

Meanwhile, the FORMIS II project was responsible for the collection of forest information at the central level, but did not cover the collection of on-field data. Thus, it was urgently needed to clarify the method of collecting forest information. Such circumstances made it easier for the on-field data collection method developed under this Project to draw attention to the central government.

Against such a background, it was highly recognized the importance of taking appropriate actions at appropriate timing and demonstrating the flexibility of projects while paying attention to movement at the central level.

Consequently, this approach will be considered as an unchanging and essential factor for engagement in the field of natural environment in Vietnam.

Chapter-IV Achievements of the project

1. Finalization of the PFMS scheme

It is considered more or less achieved the finalization of the entire PFMS scheme by improving PFMS for higher transparency and accuracy, based on PFMS, which is clearly presented as routine work.

However, further improvements are required, since there are some items that do not have enough demonstration activities and feedback, even though methodologies for individual activities were set out.

The following sections show the degree of achievement for each major PFMS activity together with future issues.

1.1. Forest change reporting

Forest change reporting by rangers based on field surveys was the activity that this Project focused on the most. Related training sessions were held more than those of any other activities. Thus, the methodology received lots of feedback, which was reflected in its improvement; therefore the degree of achievement is considered to be high.

It is still necessary to clarify issues that may potentially arise when the pilot activities with two communes under this Project are scaled up.

1.2. Database management and operation

To interlock with movement at the central level, the Project decided to adopt the definition of the database set out in the FORMIS II project. However, there was a delay in determining the definition, and the development of the database under this Project was also delayed.

Because of this, training on database management and operation was far from satisfactory, and the degree of achievement was low compared to forest change reporting.

To interlock with FORMIS II more closely, data inputting will be integrated at the provincial and district levels, which is expected to improve the database developed in this Project furthermore

1.3. QA/QC

QA/QC consists of two components: quality control using satellite images and quality assurance using random sampling field surveys.

As for quality control using satellite images, training was conducted on satellite image interpretation to improve the capacity of checking if there was any omission in the forest change reports. However, training was conducted only once, and information for forest change reporting was still being collected, so the degree of achievement was unsatisfactory.

As for quality assurance activities using random sampling field surveys, neither training nor experiments were conducted, so the degree of achievement was lower than that of any other activities.

Specific experiments must be urgently conducted according to the methodology formulated, and necessary feedback must be obtained to finalize the methodology.

2. Demonstration of ownership

As stated in Chapter 3, the use of TF has contributed to demonstration of ownership, and TF meetings held at the end of each month provided opportunities for a lively exchange of opinions.

Several trainees in the training on forest change reporting have developed their capacities sufficiently enough to work as lecturers to disseminate PFMS to other provinces. This helped them acquire confidence and work hard to implement PFMS with higher ownership.

Judging from all this, the degree of achievement in the field of demonstration of ownership is considered to be high.

Chapter-Ⅴ Proposal (way forwards)

This Project pursued to revise PFMS and improve the capacity, and has successfully built a broad framework. The achievements of the Project attracted VNFOREST and other donors very much, which have already started initial training to introduce PFMS to some provinces. To make the mechanism of PFMS used more widely, it should be clarified issues which may potentially arise when an increased number of provinces start to use PFMS. In short, it is too soon to make it a national standard at this stage.

Therefore, a stepwise approach, whereby PFMS is gradually scaled up and replicated is proposed. Below figure was presented in final technical worksop.

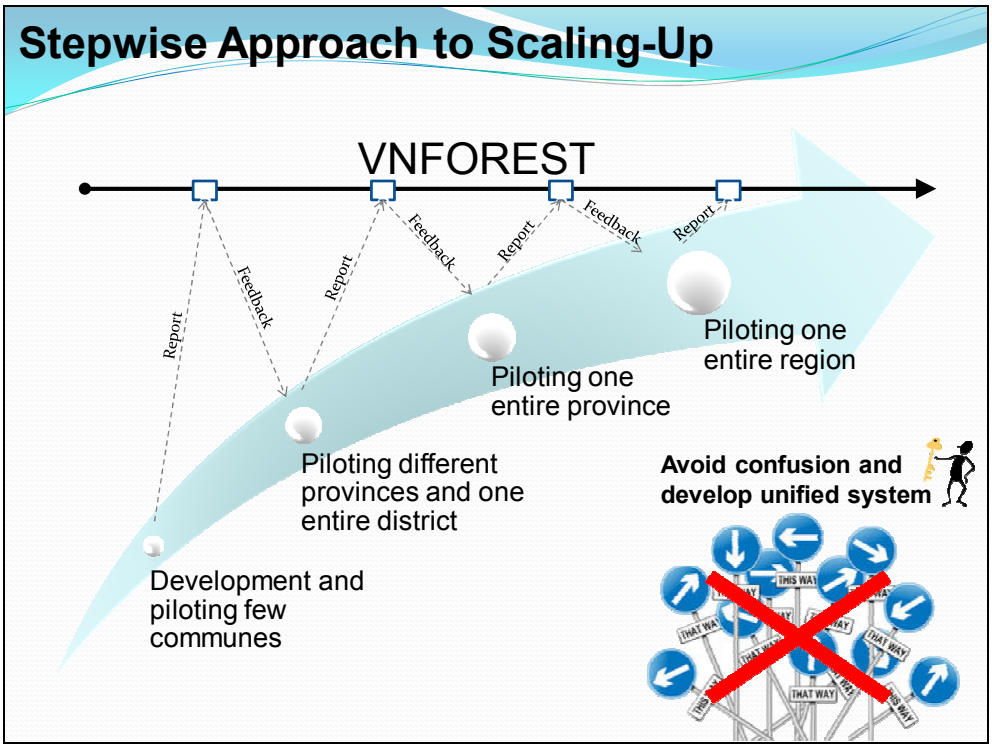

Figure 8 Stepwise approach to standardization of PFMS

At the end of July 2015, PFMS piloting plan has been planned as figure 9. It says 10 provinces are already planning to involve PRMS piloting and adequate response and support is urgent issues to be considered.

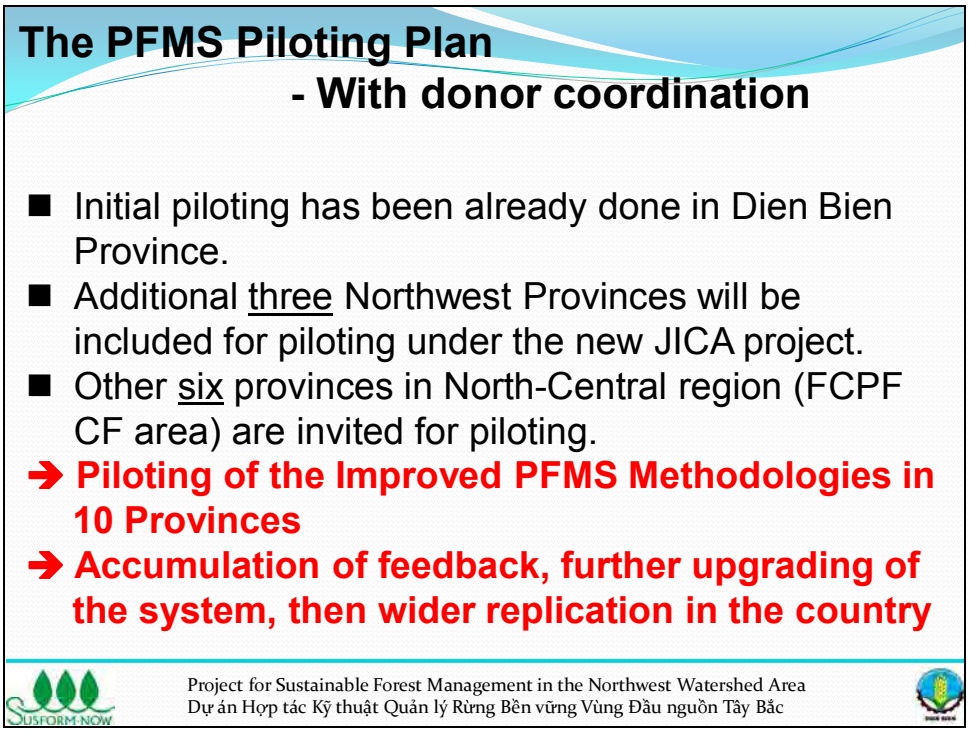

Figure 9 Current PFMS piloting plan

In response to this, JICA has announced that it will offer the following assistance.

- ☑ PFMS/FCMR tablet software.
- ☑ PFMS database package.
- ☑ A set of PFMS implementation handbook, guidebooks, and manuals.
- ☑ PFMS training material.
- ☑ PFMS trainers/resource persons.

The most serious issue here is how to secure lecturers for PFMS training. Some engineers trained in Dien Bien Province are now available, but are likely to be in charge of four provinces in the north. It is necessary to secure lecturers for six provinces covered by FCPC.

One possible solution is to train engineers of FIPI first and send them to these provinces as lecturers. Judging from the fact that FIPI shows high interest in the tablet survey system, it is believed to be a highly feasible solution.

Annex

Annex 1. Proposal for PRAP revision (PFMS parts)

Annex 2. List of Provided equipment

Annex 1 Proposal for PRAP revision (PFMS parts)

Section IV (Key Tasks):

28. As for FRL, the national FRL is currently being developed by FIPI under the contact with UN-REDD2 and expected to be submitted (as the first submission) to UNFCCC within this year. As the national FRL is being developed in a way that it can be disaggregated at provincial level easily, once the national FRL is finalized, the FRL in PRAP should be replaced with the one based on the national FRL. This replacement will inevitably trigger the revision of carbon targets in PRAP as well. Moreover, as for the inclusion of Programme 661 as national circumstances, whether or not this should be included in PRAP ultimately depends on the decision at national level. The provincial DARD should monitor the discussion on FRL or Viet Nam at both national and international (UNFCCC) levels f for necessary revisions in PRAP.
30. As for PFMS (current Subsection 1.3), as PFMS was only experimented in the two pilot communes/district in 2013-2015, further replication of the improved PFMS within the province should be expected, with training, equipment procurement, and actual operation. Clear replication plan including the number of communes (or other forest owners such as FMBs) annually covered should be identified so that the entire province can be covered under the improved PFMS by 2020. At the same time, close monitoring and coordination with the national FMS development should be done especially with FORMIS under VNFOREST, which provide assistance in the national FMS development.

Subsection 6 (Implementation of PFMS):

59. This whole subsection should be rewritten as the PFMS methodologies were completely renewed during the implementation of SUSFORM-NOW. The revision should reflect the following perspectives.
60. Current PFMS has several challenges to be improved. For example, conventional PFMS has been conducted with paper-based field survey without recording of evidence. Therefore, accuracy and credibility of the data have been questionable.
61. Under the above understanding, major revision has been made to PFMS methodologies to upgrade the system.
62. For specific contents reflecting the above improvements, refer to Annex 1.
63. Current Annexes 4,5,6,7 and 8 shall be deleted accordingly.

64. For future replication of the improved PFMS within the province, the leaders of DARD and Sub-FPD have to decide and include the number of target communes/districts and target period.

Subsection 8 (Organization of Training):

75. For Subsection 8.4 (PFMS), it is recommended to revised whole part of this subsection. This subsection shall be revised as Annex 2.

PART 4: FUNDING FOR PRAP IMPLEMENTATION

83. As for the cost of operation of forest monitoring system, the cost is calculated for the forest monitoring system with use of high resolution satellite imagery. In contrast, the newly proposed PFMS is designed to use tablet PCs. If the province will adopt the tablet-based system, the calculation of the PFMS operation cost shall be updated (expectedly lower than the current figure). Also, it seems that the unit cost of PFMS field work per commune is inconsistent between Part 4.4 (VND 6.781 million) and Annex 11 (VND 15 million), so they should be made consistent after recalculation.

Initial cost of monitoring equipment is estimated as below (million VND/commune).

Item	Unit Cost	Quantity	Total Cost
Tablet PC	4.0	119	476.0
Tablet Bag	0.3	119	35.7
Binocular	0.3	119	35.7
PCs (for dist.)	10.0	10	100.0
Server (for prov.) (optional)	70.0	1	70.0
Total			**717.4**

* The above figures do not include the cost of repair/replacement.

PART 5: STRUCTURAL ARRANGEMENT FOR PRAP IMPLEMENTATION

Annex 1 (FRLs and FRELs for Dien Bien Province)

85. For now, the interim FRL/FREL calculation can be as it is; however, once the national discussion on FRL/FREL is concluded, this annex should be fully revised in accordance with the FRL/FREL calculation at central level.

Annex 2 (Calculation of the Expected Amount of Net Carbon Sequestration)

86. For now, the interim net carbon sequestration calculation can be as it is; however, once the national discussion on FRL/FREL is concluded, this annex should be fully revised in accordance with the FRL/FREL calculation at central level (including the change in emission factors).

Annexes 4-8 (PFMS)

88. These annexes should be removed due to changes in Part 3.V.6 on PFMS.

Annexes 11 (Unit Cost for Various Activities)

95. As for the calculation for the unit cost of the forest monitoring equipment (Item 7 in the table), remove the table if the new table is inserted under Part 4.4.
96. As for the calculation for the unit cost of the field work for forest monitoring (Item 8 in the table), it seems that the unit cost of PFMS field work per commune is inconsistent between Part 4.4 (VND 6.781 million) and Annex 11 (VND 15 million), so they should be made consistent after recalculation. Also the quantity (the number of communes) should be 119 as some of these 130 communes do not have any forest.

Annex 1

Subsection 6 Implementation of Provincial Forest Monitoring System (PFMS)

6.1 Improved PFMS

The objectives of PFMS are to enhance the system to collect reliable forest information and achieve specific objectives.

As mentioned in Key tasks, three outputs gained through PFMS operation are shown below.

- Monitoring the change of current forest status
- Monitoring of Policy and Measures (PaMs) including PFES
- Verification by field check

This task has been performed by Sub-Department of Forest Protection (Sub-FPD) and to achieve these outputs, institutional arrangement and mutual cooperation between different levels are indispensable.

The PFMS is structured in a way that reporting and checking are conducted at each level of the government (provinces, districts, and communes) as well as villages and organizations with usufruct.

Figure 1 shows the overall structure of the PFMS. This structure assumes the three types of forest usufruct at the lowest level of the hierarchy.

These usufruct types include (1) forest allocated to villages (including villagers and village households); (2) forest allocated to organizations such as forest management boards, companies, and armed forces and (3) forest remained unallocated thus under the management of Commune People's Committees (CPCs).

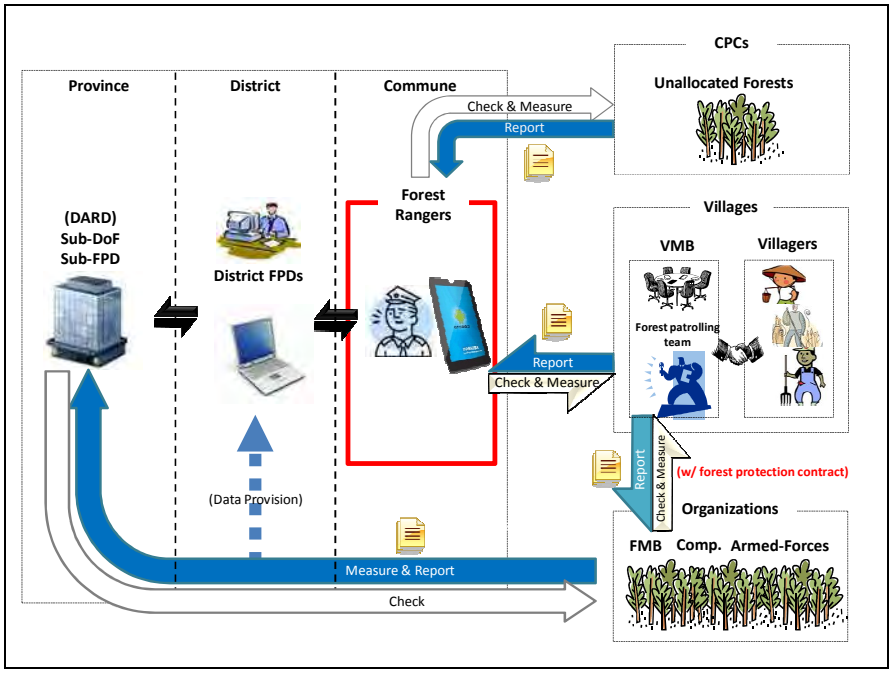

Figure 1. Overall structure of improved PFMS

The key activity steps in the PFMS are shown in Table 1. Table 1 assumes that the villages are allocated with forest; however, in other cases where forest is allocated to organizations such as

FMBs and companies, they have to assume the role of villages (for patrolling) and commune-based forest rangers (for measurement and reporting) and district FPDs (for checking and consolidation). If these organizations sign a forest protection contract with villages, forest patrolling can be delegated to VFPTs.

Table 1. Primary activities of the PFMS

Activity Step	Description	Implementer
1. Village-based forest patrolling	VFPTs undertake forest patrolling within their village boundaries and report detected forest change regularly to commune-based forest rangers.	VFPTs
2. Forest change measurement and reporting	Based on reports from VFPTs, commune-based forest rangers visit the locations where forest change is reported, measure and record necessary information with tablets, and send the data to the server (database).	Commune-based forest rangers
3. Data management and approval by district	District FPDs check the data collected by commune-based forest rangers against recorded proofs (e.g., geo-referenced photos) and revise/update the base map. Approved by the District FPD and then submit to provincial Sub-FPD.	District FPDs
4. Data management and approval by province	Sub-FPD checks the data submitted by District FPDs, consolidate all information, produce a final report, and submit to the Provincial People's Committee (PPC) and Central FPD.	Provincial Sub-FPD
5. QA/QC	Sub-FPD checks if there are any major forest change that is un/mis-reported by comparing the reported data with satellite images. (Optionally, random field checking could be performed).	Provincial Sub-FPD
Crosscutting Activities		
1. Overall management of the PFMS	Sub-FPD undertakes the management and supervision of the overall process of the PFMS implementation.	Provincial Sub-FPD
2. Human resources development	Sub-FPD systematically and regularly conducts human resources development at different levels.	Provincial Sub-FPD

For more detail of improved PFMS, please refer developed handbook, guidebooks and operation manuals.

6.2 Replication of the improved PFMS within the province

To collecting accurate and reliable forest information, improving forest measurement methodology is the major activity.

For this, replicate tablet-based forest measurement system within the province and feedback to existing system is vital.

To do so, following solution shall be taken.

- Piloting XXX communes between year XXXX and year XXXX.
- Including other forest owners such as FMBs for piloting.
- Conduct relevant capacity building.

63 Modification of PFMS with its adjustment in accordance with the national forest monitoring system

Close monitoring and coordination with the national FMS development should be done especially with FORMIS under VNFOREST, which provide assistance in the national FMS development.

In particularly, integration of PFMS-DB and Forest Resource Monitoring System (FRMS) desktop application by FORMIS is the key issue to be considered.

6.4 Evaluation of the forest change on area

The forest change shall be evaluated through PFMS, and the basic information which is necessary to revise master plans, such as FPDP, shall be organized. The evaluation of the amount of change shall be evaluation based on area.

In the whole province as a target area, the current forest status (2013) and the forest change (2020) accumulated through PFMS shall be compared at the end of Phase II.

Moreover, they shall be compared according to the forest type. Then, this result shall be compared with the past forest dynamics and compiled in a report that describes what types of forest area have changed and how much forest change (increase and decrease) have occurred.

Annex 2

Subsection 8.4 Developing capacities for forest monitoring

Before planning capacity building, it is essential to compare current situation and expected goal for gap assessment.

	Current capacity	**Expected goal 2013–2015**	**Expected goal 2015-2020**
Equipment	(1) Personal computer; 7 PC in Dien Bien district and 2 PC in Muong Cha district. GIS software (Mapinfo) already installed). Difficult to process high-resolution satellite data due to PC specification. (2) GPS:2 GPS for MM and MP. One for each district level (3) Satellite image; Covering high-resolution data (Observed Feb,2013) (4) 6 GPS camera	(1) Accumulate forest information through PFMS and store database in pilot area (2) Maintain (3) Prepare latest satellite data for piloting communes (4) Maintain	(1) Laptop PC for each district (2) Prepare Tablet PC for piloting communes (3) Maintain (4) Maintain

PC operation and data management	3 specialists in Dien Bien district and not any specialist assigned in Muong Cha district	At least one PC operator in each district and improve data management skill	One PC operator in all district
Field survey （monitoring forest change)	Preliminary technical training about collecting forest information on the ground combine with remote sensing, GPS and GIS are conducted. (One person each from pilot communes)	Continue on-the-job training in pilot commune and recycle of evaluation	Capacity development for all ranger of entire province is necessary
Forest monitoring by villagers	Not adequate information is submitted from villagers. Reasons are shortage of budget for monitoring.	Establish VMB in pilot communes and updating forest change by villager consistently.	Collecting forest information and their report adequately in entire province.

Considering above mentioned, the following capacity buildings will be conducted.

- Conducting practical on-the-job trainings on field survey skills and database operating (compiling field data, GIS operation, and remote sensing analysis) to strengthen field survey skills and to enhance the operational skills of provincial forest monitoring system.
- Conducting practical on-the-job trainings to strengthen the skills of villagers for recording and reporting forest change on the field with the support of VMB
- Holding workshops on safeguard monitoring to introduce safeguard and its monitoring system to understand the importance of safeguard in the implementation of REDD+.

Holding a meeting to set Safeguard Information System at the Provincial level after setting Safeguard Information System at the National level officially.

Annex 2 List of provided equipment

Name of equipment	Quantity	Hand over to
Tablet-PC	14	Sub-FPD
Carrying Bag	14	Sub-FPD
Data server	1	Sub-FPD