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The Feasibility of The Implementation of Forest Management Units' (FMUs') Policy: A Case Study in FMU Yogyakarta and FMU Region IX Panyabungan

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Abstract

Operationalization of forest management units (FMUs) in Indonesia still requires assistance from the government. This research aimed to build a theoretical framework to enable FMU implementation on the ground. In addition, the criteria and indicators of FMU development were developed. The research implemented a quantitative approach by using Likert scale of rationality criteria and indicators. Two locations were selected for the analysis to comparing: maturity organization level, and forest farmer groups acceptance. Calculation rationality of FMU development was carried out using ten criteria and five indicators which were elaborated from the rationality of public policy which consists technical, legal, economic, social and substantive rationality. The rationality category was made by dividing three categories, namely rational, quite rational and irrational. The meaning of rational is that FMUs can carry out forest management, maintain forest area and carry out the long term forest management plan and the short term forest management plan programs that have been formulated as FMU's forest management plans. The result showed that FMU Yogyakarta is categorized as rational while the FMU in Region IX Panyabungan is categorized as quite rational. Low organizational capacity of FMU led to lower rationality of forest management. Improvement of forest management rationality can be carried out by building partnerships and collaboration with local people by providing legal access to manage forest areas. Optimal forest utilization will increase benefits and revenue forest management unit.

Keywords: public policy, criteria, indicator, legal, access, forest management

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Introduction

Forest plays an important role in human life. Forests are the driving force of the economy, a place for growing people's culture, and guardians of living creatures to function for the sustainability and welfare of humanity (Kartikasari, 2014). However, forest sustainability has begun to be disrupted by a lot of deforestation. Deforestation is partly due to our scientific ignorance of the contribution of forests to actual and potential well-being and weak economic understanding of what is at stake; or because of a lack of institutional capacity (Myers, 1996). Contreras-Hermosilla (2000) argues that deforestation comes from a number of complicated things that exist in the community so that it needs improvement in good forest governance that can guarantee sustainable forest management.

There are problems of forest management units (FMUs) in Indonesia (1) FMUs as public service organizations are government-funded organizations, (2) FMU is not a legal entity that has the separation of property with shareholders as a pure private business organization or as a State-Owned Enterprise/Local-Owned Enterprise, (3) FMUs are running a public mission but having obligations as private legal entities as a quasi-public organizations, (4) FMUs revenue is received cannot be managed directly, but must be deposited in the regional treasury or state treasury, and (5) the capability of the organization have limitations that vary based on the maturity level of the organization. This study portrayed the factual conditions of FMUs in Indonesia and exploring efforted to improving FMU development. FMUs are expected to become a solution for problems regarding the management of forests in Indonesia, e.g., poor forest governance, tenurial problems, limiting capacity in the management of forests (Maryudi, 2016). The theoretical design was built at the synthesis stage tried to explain the importance of FMU in terms of the theory of property rights in explaining the importance of state claims to forest management areas, and the principal-agent theory to explain the importance of mastering information on forest resources

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by FMUs to avoid fraudulent permit holders. European countries were examples of successful forest management at the site level. Reference to forest management was in Germany, and the support of the German state provides donors with FMU development in Indonesia. Differential constitution and socio-economic society that causes it cannot be fully adopted in Indonesia. "The concept of forest management from Switzerland, the central government and local government still provides subsidies for forest management (Kartikasari, 2014), similar to the concept of FMU in Indonesia which was mainly in financing the salaries of FMU employees who still depend on the central and provincial governments". The concept of forest management in Java was brought by the Colonialists of the Dutch East Indies (Departemen Kehutanan, 1986), and now the form of its management is carried out by the State-Owned Enterprises (Perum) Perhutani. General criteria for success are the implementation of effective forest governance and the ability of FMUs to enforce state claims for forest management (Nugroho, 2016).

State authority to manage forests at the site level is delegated in part to FMU. FMUs as the site-level institution have been given the constitutional mandate to manage Indonesian forest as a state effort to control and secure the forest resources (Nugroho, 2016). The Indonesian central government is on its way to reclaiming authority for forest administration and management through FMU and closely related community forestry programmes (Sahide et al., 2016a). Forest management units development was supported by external influences and strong will of domestic actors (Sahide et al., 2015). International forest regimes have been influencing the development of Indonesian forest policy, and have complemented its domestic policy initiatives (Sahide, 2016b). FMUs have been developed under *Rencana Pembangunan Jangka Menengah (*RPJM*)* or "the national medium-term development plan" as a blueprint of forestry development in Indonesia.

Supporting the success of FMU, many suggestions have been given, namely providing more financial and human resources for individual FMUs, focusing on building their technical expertise for forest planning and inventory (Bae et al., 2014), creating more consistent and coherent policies and regulations (Kartodihardjo & Suwarno, 2013), clarifying the bureaucratic responsibilities of forest administration and management (Sahide & Giessen, 2015), and building the role of the *Kesatuan Pengelolaan Hutan* as Reducing Emissions from Deforestation and forest Degradation in Developing Countries (REDD+) intermediaries-cultivating their capacities as policy and Payment for Ecosystem Services (PES) intermediaries (Kim et al., 2015).

FMU implementation was less than the expectations. In October 2016, there were only 107 *Kesatuan Pengelolaan Hutan Produksi* (KPHP) equipped with clear organization, 53 *KPHP*s that have an approved The Long Term Forest Management Plan (*Rencana Pengelolaan Hutan Jangka Panjang*, RPHJP), and 15 in the ratification process. MoEF reported that only 62 KPHPs validated their RPHJP with changes in organizational structure and working procedures based on Government Regulation Numbered 18/2016. Furthermore, FMU organizations have established in 11 provinces.

In summary, there were 54 FMUs (45%) classified as under-performance that were calculated from a poor and intermediate category. Approximately 97% of FMUs were on demand for assistance from the central government for their development. This indicates that the policy of forestry development based on FMU have not fully implemented in the ground. The meaning of rationality in public policy is the reasons used in determining public policy (Nurrochmat et al., 2016). Development of FMUs is included in one of the results of public policy.

The purposes of this study were (1) to develop a theoretical framework for estimating the rationality of public policy for FMU development in Indonesia and (2) to assess FMU development based on public policy rationality. Rationality assessment was carried out by using criteria and indicators matrix with case studies in FMU Region IX Panyabungan and FMU Yogyakarta. This study was intended to provide further knowledge on how to improve under-performance FMU. Moreover, this research provides a theoretical design for a rapid performance assessment tool for FMU rationality development policies.

Methods

Research framework The sustainability development criteria and indicators were necessary to assess the current management and to recognize appropriate management approaches towards sustainable forest management (SFM) (Jafari et al., 2018). The tool to asses the performance of sustainable forest management in Indonesia was conducted by using certain criteria and indicators, i.e., the guidelines for developing, testing, and selecting criteria and indicators for SFM (CIFOR, 1999), and the Guidelines for Assessment of Development Performance and Implementation of Forest Management in FMU Areas Using FWI 2.0 Criteria and Indicators (Suwarno et al., 2018). In addition, several tools have been developed by the Ministry of Environment and Forestry (MoEF). The tools for KPHP or "production forest management units" have been developed by Director General of Sustainable Production Forests Management through Regulation Number P.6/2017 concerning The Assessment of The Performance of Sustainable Production Forest Management in KPHP.

Multi-criteria preparation in assessing sustainable forest management used the hierarchical analytical process, analytical network process methods, certain frameworks, then rating and scoring techniques. The hierarchical analytical process and analytical network process methods were used to set criteria and indicators of SFM. Zandebasiri and Parvin (2012) used the framework of pressure-state-response of natural resources management to determine key criteria and indicators of sustainable forest management while Khazaee et al. (2009) used rating and scoring techniques.

In property rights theory, FMU-based forestry development is strengthening the capacity of the government at the site level to secure the rights on forest area and to ensure the sustainability of forest resources for the greatest prosperity of the people (Nugroho, 2014). The weaknesses of an institution have been proven to be followed by policy failure to reach its target (Kartodihardjo, 2006); hence it can be interpreted the lack of government capacity in carrying

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out policies can be seen from the weakness of institutions. Efforts to achieve effective institutions according to Nugroho (2014) include (1) claims over resources must be recognized under state protection, (2) claim gets respect from another party, and (3) claims on resources will require management and enforcement costs.

Rationality means generally reasonable actions of each activity (Nurrochmat et al., 2016). There is a common thread between policy analysis and rational choice theory, seen from the nature and essence of the approach. The definition of policy is essentially a principle or way of acting that is chosen to direct decision making (Dunn, 2003; Krott, 2005; Nurrochmat et al., 2016), while the rational choice theory approach is based on the optimization of interests and efficiency (Budiardjo, 2007). The rationality of public policy consists of five types, namely technical, legal, economic, social, and substantive rationality (Dunn, 2003), but Diesing (1962) used term of politic rationality to substantive rationality.

Criteria and indicators were built to measure the rationality of FMU development. Criteria were compiled based on segregation of Dunn's policies rationality (2003) including technical, economic, social, legal, and substantive criteria. Technical rationality is a characteristic of choosing the reason for making choices which includes a comparison of various alternatives according to their capacity to advance the effectiveness of problem-solving. Economic rationality is a reasoning choice characteristic that compares alternatives based on their capacity to produce the most efficient problem-solving. Legal rationality is a characteristic of reasoning in the form of a comparison between alternatives based on legal conformity with previous regulations and judicial decisions. Social rationality is defined as reasoning selection characteristics that compare various alternatives according to their capacity to maintain valuable social institutions, namely to advance institutions. Substantive rationality is a characteristic of reasoning selection that compares various alternatives to their capacity to make the most appropriate choice between two or more forms of rationality. Derivatives of criteria are indicators. The selected indicators were the most relevant one based on a literature review (Figure 1).

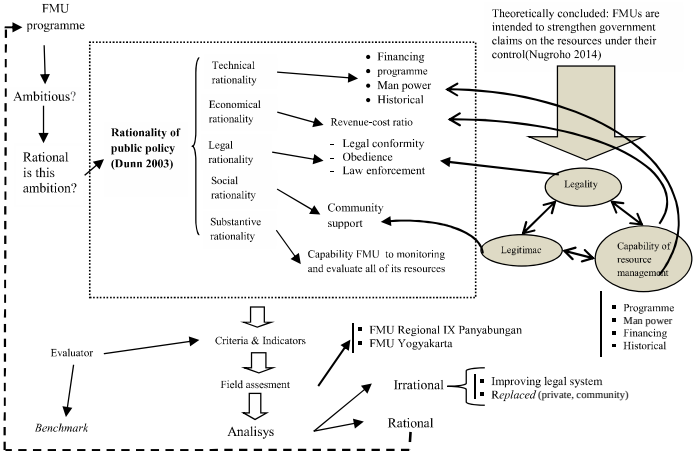

Figure1 Research framework.

Research location and the time of data collection This study was conducted in two locations including FMU Region IX Panyabungan of North Sumatra Province to represent the duration of FMUs development which has only been under ten years since 2010 (Figure 2). A research site was also selected to obtain data of FMU development outside Java Island that was enactment based on a top-down approach by the central government**.** Other KPHs outside Java have varying degrees of progress, the initial formation of which is a model FMU formed with the central government budget such as FMU Lakitan in South Sumatra and FMU West Rinjani in West Nusa Tenggara. As a comparison, FMU Yogyakarta of Yogyakarta Special Province was selected to represent the initial stage of FMU development in Java.

FMU Yogyakarta was established based on Decree of the Minister of Forestry Numbered SK.721/Menhut-II/2011 covering an area of ±15.724,50 ha (Table 2). The basic law of the FMU is local regulation Numbered 36/2008. The main commodity is eucalyptus plantation in the total area of 4.472,72 ha. Involvement of the community in forest management was arranged through forest farmer groups (FFG) with inter-cropping of the main plant and crops on the sidelines.

Designation of FMU areas was based on Forestry Minister Decree Numbered SK. 332/Menhut-II/2010 with an area of ±153.361 ha and distribution of function forest area was in Table 3. FMU management has not been divided into forest divisions and forest management resorts. After the implementation of Law Numbered 23/2014, there was a reorganization of the FMU into the FMU Regional IX Panyabungan under the North Sumatera Provincial Forestry Service in 2016. There was no permit of social forestry scheme of farmer groups for non-timber forest products utilization. FMU monitoring results observed quite a massive forest encroachment which were made settlements and planted with rubber, oil palm, and rice crops. The role of the FMU does not yet exist in the community utilization by giving recognition of legal aspects.

Research locations were selected based on the different stage of FMU organization and development in Indonesia. Well established FMU organization was represented by

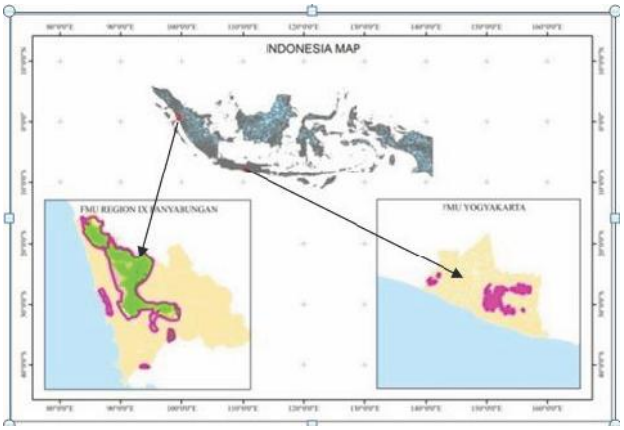

Figure 2 Research location map.

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FMU Yogyakarta (Java Island) which has a long history of forest management since the Dutch East Indies era. The dynamics FMU development can be seen outside Java Island with forest management models being initiated by the government mostly in forest areas in particular in production forest. Both FMUs do not experience significant organizational changes and RPHJP after the implementation of regulation Numbered 23/2014 concerning local government. After the stipulation of Law Number 23/2014 on Regional Government, many FMU organizations have experienced changes in their names and organizations that have an impact on changes in management plans in RPHJP. Data collection was conducted through in-depth interviews in Tabel 1. The data collection was conducted for ten months from June 2017 to March 2018.

Data analysis The criteria and indicators consisted of five criteria and ten indicators. Criteria were determined based on Dunns' (2003) public policy rationality. Indicators were compiled by elaborating the concept of each criterion through literature studies. Determination verifiers were carried out carefully to obtain the desired quality of results by the researcher with study literature and suitability in the field. The results of field verification and documents were then analyzed according to the indicator criteria matrix that has been compiled.

The research applied quantitative descriptive using Likert scale with the score of highest (5), moderate (3), and low (1). The rationality was evaluated by using a matrix which contains the indicators, verifiers, and verification methods by comparing field fact condition.

Table 1 Lists of key informant and respondents

Description	Interviewed	Person
Key informants	a. Head of FMU Region IX Panyabungan	4
	b. Head of FMU Yogyakarta	
	c. Chief section of BPHP Region II Medan	
	d. Chief section of BPKH Region XI Jawa-Madura	
Respondent	a. Ministry of Environment and Forestry	20
	b. North Sumatra Province Forest Service	
	c. Forestry and Plantation Services, Yogyakarta Special Province	
	d. Chief section of BPHP VII Denpasar	
	e. Heads of forest farmer groups	
	f. Stafs of FMU Region IX Panyabungan	
	g. Stafs of FMU Yogyakarta	
Total		24

FMU's performance of each indicator was calculated based on data and information. Determination of the value of rationality based on the judgment of researchers based on interviews to key informants and respondents (Table 1), works of literature, and reports on FMU activities. Criteria and indicators are not weighted since all indicators were assumed to have the same level of importance. Three categories of rationality assessment were (1) rational if the total score is 37–50, (2) quite rational for score 23–36, and (3) irrational for score 10–22.

Results and Discussion

The theoretical framework to enable FMU implementation is shown in Figure 6. The issue of FMU-based forestry development rationality was motivated by the lack of a meeting of the rationality of public policy in policy making with the policy product needs to be produced. It was also caused by the low capacity of FMU to carry out its main tasks and function in managing the forest. Another obstacle that often arises was the non-fulfillment of the ratio of legislation that covers policy products so that it will hamper policy implementation. The importance of paying attention to social problems through community access to forest management is an important point in the success of forest management. The weakness of FMU in controlling information resource and the occurrence of moral hazard in releasing permit license impeded forest management to achieve forest sustainability. This is a substantive part of not achieving forest sustainability.

The theoretical design was built on the rationality of Dunns' public policy with the five forms of rationality that exist starting from technical, economic, legal, social, and substantive rationality. Theoretical design validation used by triangulation on theories by comparing the study of Dunns' public policy rationality which was compared with the result of FMU performance carried out by others. Those rationalities were analyzed to produce output in the form of policy gaps (Table 4). Technical rationality was examined by analyzing organizational capabilities focusing on human resources, programs, funding, and history of forest management. Economic rationality was analyzed by cost and revenue analysis while legal rationality was analyzed by contents of the legislation analysis. Social rationality was analyzed by analyzing community acceptance around the forest and analyzing community access to forest areas in forest management participation. The last was substantive rationality by looking at the FMU's ability to control information of its resource to arrange forest management

Table 2 Distribution of forest areas in Forest Management Unit Yogyakarta

Description	Total	Location per regency		
		Gunung Kidul	Bantul	Kulon Progo
Area of production forest (ha)	13.411,70	12.810,10	0,00	601,60
Area of protected forest (ha)	2.312,80	1.016,70	1.041,20	254,90
Total (ha)	15.724,50	13.826,80	1.042,20	856,50
Percentage (%)	100,00	87,93	6,62	5,45

Source: BKPH (2012)

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decisions in its territory.

Assessing rationality The assessment result all of the rationality showed that the FMU Yogyakarta was in a rational category and FMU Region IX Panyabungan was categorized as quite rational (Table 5). The results of the rationality assessment were not different from the result performance assessment with nine criteria in the FWI 2.0 about FMU Performance Assessment Guide (Suwarno et al., 2018) which produced FMU Yogyakarta with a value of 2.66 (high category) and FMU Region IX Panyabungan with a value of 1.75 (medium category).

The advantages of these tools were (1) the measure of the success was in line with the aspect of rationality of public policy which consists of technical, economic, legal, social, and substantive rationality, (2) quick completion for policy interventions can be carried out in an effort to improve the rationality of FMU development, and (3) it's simpler which using only five criteria and ten indicators.

Validity is measured by triangulation of sources, methods, and theories. Measurements will be effective if the condition almost the same as the case of FMU Yogyakarta and FMU Region IX Panyabungan. Limitation of criteria and indicators has not been carried out weighting. It was assumed that all values are the same, so weighted assessment needs to be added for measuring score of the criteria and indicators.

Technical criterion Technical rationality consists of four indicators including program, human resource, funding, and history of management. The technical ability of an organization to carry out an activity is called organizational capability, which according to the Business Dictionary (2018) means that it is expressed in terms of (1) human resources: number, quality, skills, and experience, (2) physical resources and materials: machinery, land, buildings, (3) financial resources: money and credit, (4) sources of information: collections of knowledge and databases, and (5) intellectual resources: copyright, design, patents, etc. FMU's technical ability in carrying out various roles of forest management becomes important (Kim et al., 2015). The important thing in the continuity of the FMU program is the availability of adequate funding sustainably. The ability to

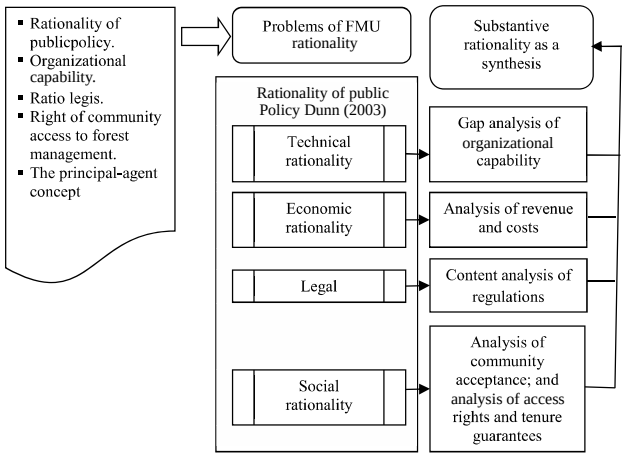

Figure 3 Theoretical framework.

Table 3 Distribution of forest areas in Forest Management Unit Region IX Panyabungan

Description	Area
Area of production forest (ha)	13.361,45
Area of limited production forest (ha)	108.056,47
Area of protected forest (ha)	12.047,32
Area of production forest under convertible forest (ha)	19.895,76
Total (ha)	153.359,90

Table 4 Theory and concepts for criteria and indicators

Criteria	Indicators	The concept used	Sources
Technical	⎩Human resources ⎩Funding ⎩Programme ⎩History of forest management	Organizational capability; Path dependence theory	Mintzberg (1989), Ekawati (2012), Zubair (2014), Utami and Wartono (2015) Bussines Dictionary (2018), Suwarno et al. (2018)
Economic	Revenue and management ratio per hectare.	Costs and benefits for public service organizations	Dunn (2003)
Legal	⎩Compliance with the hierarchy regulations above ⎩Forest community obedience before the environment and forest law ⎩Law enforcement	Legal system Ratio legis	Mertokusumo (2003), Kordela (2018)
Social	Extensive access and management area ratio	Access rights of natural resources	Schlager and Ostrom (1992)
Substantive	Mastery of resource information as a basis for management	Principal -agent theory	Zubair (2014), Nugroho (2014, 2015), Maryudi (2016)

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Table 5 Assesment of the forest management unit (FMU) development rationality

Criteria	Indicator	FMU Yogyakarta	FMU Region IX Panyabungan
Technical	) Programe	5	3
	) Funding	5	3
	) Human resources	3	1
	) Forest management hystory	5	1
Economic	Ratio benefit-cost (per ha)	5	1
Legal	) Compliance with the hierarchy regulations above	5	5
	) Forest community obedience before the envieronment and forest law	5	3
	) Law enforcement	5	3
Social	Access legal for forest community	5	3
Substantive	Mastery of resource information as a basis for management	5	1
Total		48	24
Category		Rational (37–50)	Quite rational (23–36)

obtain generic income is important for the independence of FMUs (Nugroho, 2014).

Funding FMU in Indonesia was classified into three categories based on the status and function of the landscape including Production Forest Management Unit under the management of KPHP, Protection Forest Management Unit under *Kesatuan Pengelolaan Hutan Lindung* (KPHL) and *C*onservation Forest Management Unit under *Kesatuan Pengelolaan Hutan Konservasi* (KPHK).

Establishment of KPHL and KPHK was less problematic in term of funding since the protection and conservation functions were under central government responsibility. In opposite KPHP development is more complicated. Production forest function in state forest areas was a unique condition due to the requirement to produce certain forest products. Thus, managing creativity and innovation will determine the success of management.

A mature organization must have sustainable funding to guarantee activities implementation. The government funds FMU as a public service organization. In addition, other funding sources can be also used to finance FMU. FMU received government budget from the state budget (*Anggaran Pendapatan dan Belanja Negara*, APBN) and local government budget (*Anggaran Pendapatan dan Belanja Daerah*, APBD). Other funding sources can also be utilized to support FMU budget including more national and international assistance.

FMU's funding has the opportunity to be developed as Local Public Service Agency (*Badan Layanan Umum Daerah*, BLUD). The BLUD status can recruit human resources and have financial management flexibility. However, establishment of BLUD is challenging. Several preparations are necessary including local regulations and improvements of financial administration (Ekawati et al., 2018).

The ratio of funding to the total area of FMU management in 2017 for FMU Yogyakarta was IDR 762,011.11 ha^{-1} and FMU Region IX Panyabungan IDR16,972.02 ha^{-1}, respectively. FMU Yogyakarta has been able to cover all of 15 key activities listed in RPJHP and the Short-Term Forest Management Plan (*Rencana Pengelolaan Hutan Jangka Pendek*, RPJHPdek). Inapposite, FMU Region IX Panyabungan still depends on facilitation and external assistance to implement activities. FMU management cannot freely develop activity plans in the RPHJP and RPHJPdek since it has to be arranged according to FMU facilitators and assistance. The facilitators are provided by central government. APBD has covered more than 75% of FMU's management funding. In the other hand, FMU Region IX Panyabungan can cover only between 50–74% using multiple sources including from national budget APBN and APBD to carry out RPHJP/RPHJPdek (Table 6).

Human resources The number of human resources directly involved in forest management can be found in Table 7. As a public service office and funded by the government budget, it was difficult to increase the number of personnel.

Local government officer is financed from APBD under three different schemes including local civil servant, consultant, and daily workers. The central government also assists FMU by providing technical personnel financed under APBN as a consultant which contract can be renewed every year.

Based on internal analysis conducted by FMU Yogyakarta, it is estimated that the addition of 166 personals is needed to support the FMU activities (BKPH Yogyakarta, 2017a). The ratio of area responsibility per person was 2×10^{-4} (person ha^{-1}) in FMU Region IX Panyabungan and 140×10^{-4} (person ha^{-1}) in FMU Yogyakarta. The optimal FMU personal number has been estimated by Utami and Wartono (2015) and suggested that the human resource requirement for a large and medium size FMU was 90–120 personal and 60–89 personal, respectively. Today FMU Yogyakarta has 217 personal; thus it has fulfilled the proposed human resource sufficiency (Table 7).

Education level and training skill have to be considered for assigning head of FMU. The central government has educated and trained prospective people and requested local

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Table 6 Assesment result of the funding indicator

Attribute	Facts	
	FMU Yoyakarta	FMU Region IX Panyabungan
Adequacy of funding for forest management sourced from APBD, APBN and other sources extends FMU areas compared to RPHJP/ RPHJPdek	Funding in FMU Yogyakarta has a sufficient budget for forest management sourced from the Regional Budget compared to RPHJP/RPHJdek over 75%.	Funding in FMU Region IX Panyabungan adequate forest management budgets sourced from APBD, APBN and other sources to expand the FMU's area compared to RPHJP/ RPHJPdek between 50% and 74%.
Score	5	3

Score 5: attribute fulfillment if more than 75%; score 3: attribute fulfillment if between 50–74%; and score 1: attribute fulfillment if less than 49%, APBD: local government budget; APBN: state budget; FMU: forest management unit; RPHJP: the long term forest management plan; RPHJPdek: the short term forest management plan

Table 7 Number and ratio of forest management human resources

Description	FMU Yogyakarta	FMU Region IX Panyabungan
Management area (ha)	15,724.50	153,361
State civil servants (person)	145	21
APBD contract labor (person)	50	-
APBN contract labor (person)	14	4
Temporary employees (person)	8	5
Total (person)	217	30
Ratio of area of management-human resources (person ha^{-1})	140×10^{-4}	2×10^{-4}

FMU: forest management unit; APBD: local government budget; APBN: state budget

Table 8 Assesment result of human resources indicator

Attribute	Fact	
	FMU Yogyakarta	FMU Region IX Panyabungan
The number and proportion of human resources were sufficient according to the level of education and training, and carry out the responsibilities given to run RPHJPdek	Based on internal calculations, there needed for 166 people (BKPH 2017a). The ratio of the number of human resources to management was 140×10^{-4} people ha^{-1}	There was a shortage of human resources around 30 people. But the facts in the field are resources that have excessed labor at certain times. The excessed of human resources was due to the emerging level of organizational maturity, sporadic activities that have not focused on one main activity, and have not divided the management area into smaller parts at the site level (resort forest and forest area compartments). The ratio of the number of human resources to management was 2×10^{-4} people ha^{-1}
Score	3	1

A score of 5: attribute fulfillment 75% and above; score 3: attribute fulfillment 50–74%; score 1: attribute fulfillment less than 49%; FMU: forest management unit; RPHJPdek: the short term forest management plan

Table 9 Assesment result of the programme indicator

Attribute	Facts	
	FMU Yogyakarta	FMU Region IX Panyabungan
The suitability of activities with principal duties and functions of FMU has covered the RPHJP's key activity	The implementation of the RPJHPdek as part of the implementation covered 15 RPJHP's key activity in FMU Yogyakarta which reached 100%.	The implementation of the new RPJHPdek covers 8 key activities as part of the implementation of the RPJHP in FMU Yogyakarta which has reached 53,33%
Score	5	3

Score of 5: suitability of activities with the FMU's principal duties and functions, has covered the key activities up to 75% and above; score 3: suitability of activities with the FMU's principal duties and functions, has covered the key activities between 50%–74%; and score 1: suitability of activities with the FMU's principal duties and functions, has covered the key activities less than 49%; FMU: forest management unit; RPHJP: the long term forest management Plan; RPHJPdek: the short term forest management plan

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governments to provide opportunities for those who have passed the training to occupy the positions as head of FMU. Our observation found that the head of FMU Region IX Panyabungan has not attended the training, while in FMU Yogyakarta has attended the training (Table 8).

The expertise needed to manage FMU has been described in Decree of the Minister of Manpower and Transmigration Numbered 68/2003. The standard for the Indonesian national work competency for forestry sector covered forest planning, forest utilization, forest rehabilitation, watershed management, seedlings planting, forest protection and nature conservation, and forest administration. The standard aimed to provide a reference to the criteria of work competency to establish professional human resources (Aruan, 2017a; 2017b). In particular, criteria and regulation of education level and training skill on the majority of FMU technical personnel in both research locations have not met the competency standards. However, there has been no fair reward and sanction due to this issue.

Programme During our research, we assessed the program implementation by analyzing the activities that will be carried out. We conducted the assessment by reviewing the document of RPJHP. We focused our assessment on 15 RPJHP's key activity. FMU Yogyakarta has implemented a majority of the main tasks and functions as obligated by government regulation Numbered 6/2007 and Numbered 3/2008. In another hand, FMU Regional IX Panyabungan has not been able to implement the main tasks and functions with only 53.33% key activities being implemented (Table 9).

History of forest management Historical institutions describes the current policy behavior and structure of public choice that strongly influenced by past policies. The historical approach indicates that the early institutional elements will continuously influence the current behavior. The core concept of the policy approach used by historical institution experts was not only the path dependency or attachment between current and past policy, but also interest in the idea of the form and sustainability of the policy direction (Peters et al., 2005; Zubair, 2014). The advantages of historical approaches, especially in institutions (Steinmo, 2008) were (1) various decisions and policies occurred within a certain historical time, (2) actors and agents can learn from experience, and (3) decisions taken in the future often reflect on past experiences.

History of forest management in Java The history of forest management in Java and outside Java was different. Planting teak trees was a culture in the Javanese community. Between 1600–1677, during the arrival of the Dutch East India Company on Java Island, teak trees have been considered as a very important economic resource. Teak wood was used to make ships and also to build cities with wood construction (Departemen Kehutanan, 1986; Boomgaard, 1992). In the Deandels era, the bureaucracy was set up to reduce forest area as a management of teak plantations to guarantee government monopoly andavailability of labor and manufacture of ships (Peluso, 1991) with several regulatory elements that were valid for up to 2 centuries including (1) all forest are declared as the domain of the state (*landsdomein*), forest to be managed for state benefit, (2) forest management assigned to a branch of the civil service created explicitly for that purposes, (3) the forest divided into parcels (*perceel*), to be logged and replanted on a rotating basis, and (4) villager access to teak was restricted and only collection of feadwood and non timber forest product was permited (Departemen Kehutanan, 1986; Peluso, 1991). Labor in the forest was moved to the rural area around the forest by Deandels, and they received payment for their work. Forest management was restructured during Rafless era from 1811–1815. In this era, attention to the preservation of teak forests was low, but this era left many conservation forests (Peluso, 1991). The workers from the Deandels era received no wages; however, as compensation, Rafles gave deduction from the obligation to pay taxes to the government (Departemen Kehutanan, 1986).

In 1816 forest management was returned under the Dutch colonial rule, but the arrangement was no better than Deandels. In 1830–1870 under Van Den Boschs' era, forced planting policy was introduced and the regulation on forest harvesting was ignored. Development of the sugar factory reduced a substantial number of the tree. Severe forest damage was observed especially close to sugar, indigo, and tobacco factories. Teak trees were harvested without harvesting rules; thus, teak was harvested above its potential. Large wood was needed to build factories and warehouses of sugar cane, tobacco, and tilapia (Departemen Kehutanan, 1986). Scientific forest management in Java is under Forestry Service authority to strengthen forest management in Java Island (Galudra & Sirait, 2009).

Bruinsma proposed criticism on forest management. He suggested reviewing Bosch Reglement 1868 by proposing some forest management improvements including restrictions on harvesting, careful mapping, and forest inventory implementation. The enactment of a new forest regulation in 1897 was formulated by Bruinsma by determining the size of teak management forest area or houtvesterij around 8,000 ha minimum and 10,000 ha maximum. Each area must be managed by *houtvester* or the second class *houtvester (*leader of FMU forester*)*.

Based on the results of interviews with the head of FMU Yogyakarta, we found that in 1957 Forest Area Management Plan (*Rencana Pemangkuan Kawasan Hutan*, RPKH) has been developed. The document has been used as the scientific basis during Dutch management as a legacy forest management compilation. In 1961 when the forestry service organization established, the officer still familiar with the RPKH. Teak forest damage due to unsuitable bonita has lead to the selection of eucalyptus as the new fast growing species. Introduction of technology on eucalyptus oil mill was carried out in 1987. From 1992 to 1993, the trial of eucalyptus harvest yearly and the paradigm shift from utilization to exploitation begins to increase local Own-Source Revenue (*Pendapatan Asli Daerah*, PAD).

History of forest management outside Java Island Forest management outside Java Island started from forest exploitation in East Sumatera by private companies. In 1926, a logging company with Chinese power and capital "*panglong*" was working in the Riau islands, Lingga,

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Singkep, Bengkalis, and Indragiri Hilir. In 1902, forest exploitation was recorded in Aceh at Simeulue Island and in 1903 at the bay of Sinabang. Kapur wood was exploited in 1908 in Singkil of Aceh (Departemen Kehutanan, 1986).

Exploitation of natural forests was also conducted by government. Forest exploitation was carried out in Lampung in 1918, Agam (West Sumatera) from 1920 to 1924, Tanah Karo (North Sumatera) from 1920 to 1924, and Ombilin (West Sumatera) from 1920 to 1926. However, the government failed to sustain exploitation due to organizational issues and financial failure. The biggest obstacles were labor problems, lack of marketing possibilities, and administration issues. In 1941 the government was also tried to extract timber in Sampit (Central Kalimantan), Batulicin (South Kalimantan), and Semangus (South Sumatra). However, it was not successfully implemented due to war with Japan (Departemen Kehutanan, 1986).

After the issuance of the Foreign Investment Law Numbered 1/1967 and the Forestry Law Numbered 5/1967, the era of forest exploitation outside Java started to expand. North Sumatera region had begun to exploit timber in natural forests. However, management of natural forest was not able to copy the advanced management of teak forest in Java Island. Forest and infrastructure management was discontinued by FMU during this period. In addition, the relationship has not established between local communities who used natural forests by concession holders. The encroachment of forest areas left a heavy burden on FMU to resolve.

Organization of FMU Region IX Panyabungan has not divided into the smallest unit of forest plots. This FMU also has not revised the RPHJP to respond to the renewal of North Sumatera Province spatial plan. Most of the FMU management area has been designated by the central government under utilization permits. The remaining areas that have not been utilized were only 62.094,09 ha. However, it was still challenging for the FMU to manage the area. The results of the assessment of the historical management indicators of each FMU in Table 10.

Economic criterion Financing has been one of the primary topics of ongoing discussions on SFM for at least two decades (Singer, 2016). Then, forest financing can be defined as all financing sources that flow into forest sector activities, including conservation, community forestry, forestry training, policies and administration, and forest-related industries, notably timber. This may include financing flows for unsustainable practices such as over-logging (Singer, 2016).

Economic criterion was calculated based on the revenue-cost ratio in each FMU for fiscal from 2015–2017 year (Table 11). The income-cost ratio with the source of revenue for non-tax revenue (*Penerimaan Negara Bukan Pajak*, PNBP*)* or "non-tax revenue" and (*Pendapatan Asli Daerah*, PAD) in FMU Yogyakarta was higher compared to FMU Region IX Panyabungan.

The results of the assessment of economic criteria and indicators in Table 12.

Legal criterion The development of FMUs in their implementation has 27 regulations that regulate the level of implementation. These laws and regulations had vertical and horizontal harmonization at the level of legal norms. The role of FMUs in carrying out the intermediary role of international, national and provincial interests with the forest community as in the REDD+ case requires the consistency of government policies and regulations (Kim et al., 2015). So that the role of legal criterion was to see aspects of legality, the legitimacy and usefulness of foreign regulations became very important. The results of the assessment of legal legality indicators in Table 13.

However, we found no obstacle related to legislation which can hamper the operation of the FMU organization. Encroachment into FMU area and pressure on biodiversity at FMU Region IX Panyabungan were monitored in two sub-districts including Batang Natal and Muara Batang Natal. The area encompasses 40 villages with a total area of approximately 2,435 ha. Moreover, hunting of sumateran tiger was also in the public spotlight. Illegal logging was

Table 10 Assesment result of the forest management history indicator

Attribute	Facts	
	FMU Yogyakarta	FMU Region IX Panyabungan
Mastery of information management was an illustration of the maturity level of the process of implementing activities in an organization that aims to measure the ability of an organization to implement forest management	Based on the history of forest manag ement, the class of FMU companies as the core business wereteak, pine and eucalyptus wood long before the formation of the FMU Yogyakarta organization. Forest management business capital has reached one management cycle and mastery of information management has described the maturity level of FMU organizations due to data mastery during research. Now it extend ed to efforts to utilize ecotourism environmental services.	The history of the management included in it was the management of natural forests and indus trial plantations. But mastery of information management has not yet described the level of maturity of the organization. Because FMU was only a supervisor and not a full manager of forest resources in his working area. Primary data on forest resources were not available in full. Currently FMUs were building partnerships with communities by building non-timber forest products businesses.
Score	5	1

Score 5: management time is more than one time the core business management cycle; with mastery of management information towards the organizational maturity stage; score 3: time management has not become one of the core business management cycles; by mastering management information towards the organizational growth stage; score 1: forest management with a new core business, while still not mastering management information towards the organizational growth stage; FMU: forest management unit.

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accepted as a disturbance in FMU Yogyakarta however the logging rate was not significant. The results of the assessment of legal legitimacy indicators in Table 14.

In legal criteria, we used indicators on illegal community activity related to FMU area and biodiversity. For example, in FMU Yogyakarta we recorded illegal logging cases in forest areas. Human-tiger conflict in FMU Region IX Panyabungan area was the major issue. Furthermore, there was forest encroachment founding forty villages in two sub-districts with an area of 12,435 ha. Efforts to enforce state claim on forest area through FMUs were reflected in law enforcement indicator including by prevention and repression. There have been cases in the FMU Yogyakarta processed in court, while in FMU Region IX Panyabungan

Table 11 Revenue and cost ratio year 2015–2017

Verifier	FMU Yogyakarta (year)			FMU Region IX Panyabungan (year)		
	2015	2016	2017	2015	2016	2017
Revenue (only PAD) (Rp ha^{-1})	511,393.98	425,858.08	711,936.91	-	-	-
Benefit included PNBP (Rp ha^{-1})	513,203.35	432,760.17	739,133.76	10,774.87	3,763.69	5,034.64
Cost (Rp ha^{-1})	541,889.07	551,164.49	755,507.43	6,561.21	4,560.16	16,972.02
Benefit-cost ratio	0.94	0.77	0.94	0.00	0.00	0.00
Benefit (included PNBP)-cost ratio	0.95	0.79	0.98	1.64	0.83	0.30

Costs originating from the APBD were direct costs (not payments for civil servants' salaries) FMU: forest management unit; PAD: local own-source revenue: PNPB: non-tax revenue. Source: report and interview result (2015, 2016, and 2017).

Table 12 Assesment result of the economic criterion

Attribute	Facts	
	FMU Yogyakarta	FMU Region IX Panyabungan
Revenue-cost ratio in public organizations (ha^{-1})	The revenue-cost ratio in FMU Yogyakarta for three consecutive years shows an increase from 0,94; 0,77; and 0 ,94 and if the revenue was included in PNBP, there was an increase of 0,95; 0,79; and finally 0,98.	The revenue-cost ratio for three consecutive years was empty, and if the revenue was included in PNBP then there was a decrease from 1.64, 0.83, and finally 0.30.
Score	5	1

Score 5: the fulfillment of attributes 0.9 and above; score 3: the fulfillment of attributes is 0.75–0.89; score 1: the fulfillment of attributes <0.75. FMU: forest management unit; PNPB: non-tax revenue.

Table 13 Assesment result of the legality of legal indicator

Attribute	Facts	
	FMU Yogyakarta	FMU Region IX Panyabungan
The harmony of the laws and regulations governing FMU both horizontally and vertically	Vertical and horizontal regulations and vertical regulations are harmonious with regard to the laws and regulations governing forest management, so that FMU operations can run, however it needs to be adjusted again with the issuance of Law Number 23of 2014. Regional Regulations/actions/Governor/ Regulation	Legislative and vertical regulations and vertical regulations are harmonious with regard to laws governing forest management, so that FMU operations can work. However, it needs to be adjusted again with the issuance of Law Number 23/2014.
Score	5	5

Score 5: Harmonization of laws and regulations governing FMU both horizontally and vertically so that FMU operations can run smoothly; score 3: the disharmony of regulations that regulate FMU both horizontally and vertically which causes FMU operations to be not optimal; and score 1: The disharmony of regulations that regulate FMU both horizontally and vertically which causes FMU operations to stop altogether. FMU: Forest management unit.

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law enforcement was at socialization stage and prevention programs without any prosecution case. Results of assessment of law enforcement indicators in Table 15.

Social criterion Partnership activities in FMU Yogyakarta with the community were also conducted through Social Forestry scheme with 51 farmer groups and local cooperation with third parties by planting fast-growing teak species 1,000 ha. In addition, a partnership on building ecotourism services was developed with *Koperasi Noto Wono*. Collaboration was also established with six universities to plant teak in the Special Province of Yogyakarta. In the past, in the territory of the Sultanate of Yogyakarta, the kings' land control system had been applied which gave a mandate in the form of land deeds to the community to manage the land, but after the latest national land law which states that the land controlled by the community is state forest. The most conflict took place 1,773 ha in the forest area under tanah *afkhiring bosh* (AB) land status as gift land from the King of Yogyakarta to cultivate perennial plant and trees (Anggraeni, 2012; Sumarsono, 2015). "Social forestry scheme was conducted under the scheme of Community Forest 1.062,95 ha in Gunung Kidul Regency 35 units and Kulon Progo seven units; people plantation forest 327.73 ha in *Kecamatan* Semanu, Gunung Kidul Regency, and village forest 627 ha in *Kecamatan* Saptosari, Gunung Kidul Regency (BKPH Yogyakarta, 2017b)". It was expected that the social forestry scheme could overcome the tenurial conflicts.

Legal access to the forest in FMU Yogyakarta was given in "*pesanggem*" land to cultivate staple plants and vegetable crops (*palawija*), permit to develop environmental services and ecotourism, and social forestry permit. Our study in FMU Region IX Panyabungan found that access to FMU area was carried out through partnership in the cultivation of patchouli, red ginger, and apiculture in the forest area.

The allocation of the area for community partnership in FMU Yogyakarta was 40% (Table 16). This indicates a well-established relationship between FMU and the local community. Thus we suggest that social programs have been implemented on the ground. Community access to the forest provided opportunities for improving community welfare. Community access to FMU Region IX Panyabungan was low (0.04%). However, this number did not represent encroachment and occupation of forest areas for agriculture. It has been reported that encroachment of forest areas occurred around 40 villages around forest covering an area of 2,435 ha. This issue must be resolved through law enforcement. Providing further access through the social forestry scheme will increase the percentage of the community to land access. The results of the assessment of social criteria and indicators in Table 17.

Substantive criterion Substantive criteria explained the ability of FMUs to obtain accurate natural resource information as material for managing their forests. Actual and potential resources information and capability to monitor all permit holders can reduce asymmetric information between government as regulator and license

Table 14 Assesment result of the legal legitimacy indicator

Attribute	Facts	
	FMU Yogyakarta	FMU Region IX Panyabungan
Public obedience (legitimacy); violation of the area and biodiversity	Legal legitimacy seen from the obedience of the community around the FMU is that there are disturbances in security, such as tree theft, but it still has not disturbed in other words, it was not too significant to disrupt FMU operations.	Public adherence to violations of areas and biodiversity shows that the legal legitimacy in FMU Region IX Panyabungan was still not good, as evidenced by the vast encroachment area monitored in 2 sub-districts, namely in Batang Natal and Batang Natal Estuary which are recorded in 40 villages with 2.435 ha; and there is a hunt for sumateran tigers that is in the public spotlight.
Score	5	3

The score 5: that there is public obedience (legitimacy) not to violate regulations regarding biodiversity and area; score 3: a case of a small number of people who violate regulations on biodiversity and areas; and score 1: a large part of the case of people who disobey the rules not to violate regulations on biodiversity and areas. FMU: forest management unit.

Tabel 15 Assesment result of the law enforcement indicator

Artribute	Facts	
	FMU Yogyakarta	FMU Region IX Panyabungan
There was law enforcement that starts from prevention and enforcement	Existing security problems are enforced by the law in accordance with applicable laws and regulations	The existence of security disturbances in the form of land tenure within the forest area has not been implemented by law. FMU officers prioritize socialization and awareness that existing forest areas have been encroached. But there has been no law enforcement effort.
Score	5	3

Score 5: there was law enforcement (prevention and enforcement); score 3: the existence of law enforcement (prevention efforts but does not take action against forestry and environmental crimes); and score 1: that there was not law enforcement. FMU: forest management unit.

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holder as an implementer (Zubair, 2014; Nugroho, 2015; Maryudi, 2016). The role of FMU was a bridge of data and information accuracy in reporting license holder to the central government. The results of the assessment of substantive criteria and indicators in Table 18.

The assessment results using criteria and indicators developed by Budiningsih et al. (2016) that categorized FMU's typology based on the characteristics of FMU managers, participation of the parties, and the potential of their business, showed that until 2015 only 27 FMUs (22.50%) were categorized as very good, 39 (32.50%) as good (characterized by an understanding of the FMU's concept, adequate and capable human resources, high party support, and good business potential), 23 (19.7%) as intermediate (characterized by an understanding of the concept of moderate KPH, number and human resources capabilities were available but not enough, the support of the parties was medium, and the business potential was moderate), and 31 as (25.83%) as poor category (characterized by a lack of understanding of the concept of FMU, the number and capability of human resources was not enough, the support of the parties was lacking, and the business potential was lacking).

Improvements can be undertaken by considering the low value criteria. The underperformance of technical criteria were human resources indicator. Increasement of personnel was urgently required to implement the program according to RPJHP. Budget in FMU Region IX Panyabungan was mostly covered by central government and foreign grants compared to the APBD. A further step towards the rational category is to

Table 16 Providing legal access to the community into the FMU area

Access scheme	FMU Yogyakarta	FMU Region IX Panyabungan
Community forest (ha)	1.279,75	-
People Forest Plantation (ha)	327,15	-
Village forest (ha)	627,00	-
Partnership in NTFP or agroforestry (ha)	4.060,30*	60,00
Total	6.294,20	60,00

The same area with eucalyptus plants, all were intercropped through agreements between FMU and FFG; FMU: forest management unit; FFG: forest farmer group; NTFP: non timber forest product

Table 17 Assesment result of social criterion

Attribute	Facts	
	FMU Yogyakarta	FMU Region IX Panyabungan
The level of community participation in forest use with management parameters compared to the FMU area	The percentage of community access to the forest was 40%; village community institutions that were willing to work together with FMU have gone well. Greater community involvement in forest management suggests that social problems in the FMU management area were good	The percentage of land granted to the community only reached 0.04%. The small access of the community to the forest area did not mean that the community did not dare to encroach and occupy the forest area for agriculture
Score	5	3

Score 5: The level of community participation in forest use with management parameters compared to FMU's area more than 20%; Score 3: the level of community participation in forest use with the parameters of managed land area compared to FMU's area less than 19% and Score 1: that there is no community participation in forest utilization. FMU: forest management unit.

Table 18 The Assessment of substantive criterion

Atributte	Facts	
	FMU Yogyakarta	FMU Region IX Panyabungan
Mastery of resource information as a basis for forest management	Forest management in FMU Yogyakarta was known by almost all data management information. Almost all fields of management were managed by themselves. The forest management delegation through the issuance of permits to third parties through social forestry schemes (village forests, community forests and community plantations) was only 14.20%.	Mastery of data and information was managed by FMU Region IX Panyabungan when viewed from the extent of third party permits through the utilization business licenses for natural forest (IUPHHK-HA) and for plantation forest (IUPHHK-HT) which reaches 83.74% of the entire area FMU. The percentage of third party management, so that most of the actual and potential forest potential information data was held by third parties.
Score	5	1

Score 5: controlling all information about actual and potential resources and becomes the basis for monitoring forest management and permit holders; Score 3: control of some actual and potential resource information and is the basis for monitoring forest management and permit holders; and Score 1: not to master information about actual and potential resources and become the basis for monitoring forest management and permit holder.

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provide legal access to the community to be involved in forest management by the social forestry scheme. This will increase the value of forest area when calculating the total benefit of the forest areas.

Legal access to the community can be achieved through collaborative programs including forest management partnerships, social forestry scheme, and management cooperation. This access was in line with the strategy based on institutional options between the capacity of the state and social capital (Birner & Wittmer, 2000; Nurrochmat, 2005; Nurrochmat et al., 2016; Nurrochmat, 2017). In addition social forestry program, FMU Yogyakarta also developed independent forest management by involving the community to maintain staple crops while at the same time allowed them to use the space between the main crops with crops such animal feed and nuts.

Conclusions

Estimating the rationality of FMU-based forestry development can be conducted using five criteria and ten indicators which were elaborated from public policy rationality. These rationalities were analyzed to produces output in the form of policy gaps. Institutional capacity determined the performance of forestry development. Technical rationality was examined by analyzing organizational capabilities focusing on human resources, programs, funding, and history of forest management. Economic rationality was analyzed by cost and revenue analysis while legal rationality was analyzed by contents of the legislation analysis. Social rationality was analyzed by analyzing community acceptance around the forest and analyzing community access to forest areas in forest management participation. The last was substantive rationality by looking at the FMU's ability to control information of its resource. The assessment was carried out by calculating and filling in the rationality matrix of each FMU.

The study found that the FMU Yogyakarta was in the rational category while FMU Region IX Panyabungan was categorized as quiet rational. Rational category means that FMU will be able to carry out FMU operations at the site level with the support of the capabilities of its FMU organization, community social support and existing legal instruments, supported by forest resources that produce high economic value, and master forest data and information as a basis forest management decisions. The category quite rational means that FMUs are able to operate FMUs at the site level with the support of limited FMU organizational capabilities, social support and existing legal instruments, supported by forest resources that produce economic values that have not been managed optimally, low mastery of data and information sources forest power as a basis for forest management decisions.

The main criteria that play a role in this case study were legal aspects. Legal aspects consisted of the legal suitability of legal instruments both vertically and horizontally, the legitimacy of the parties and the community, and law enforcement. FMU will achieve a good level of rationality when legal aspects are compatible with all operational activities of FMU.

Improvement can be carried out by taking into account criteria with low value. This was reasonable since many FMUs outside Java island were at the development stage that required central government assistance. To overcome the weaknesses of the technical criteria or the capacity of FMU organization, cooperation with the private sector could be established. High social unrest would decrease the possibility of investment. Therefore, legal access can be granted to the community under collaborative programs such as forest management partnerships or through social forestry scheme. Social forestry scheme can be less successful due to mistakes in understanding social phenomena in society and lack attention to production planning and marketing strategies.

Increased activity within forest areas through collaborative forest management would increase score of social and economic criteria. The low capacity of FMU organization confirmed the low rationality of forest management. Improvement of forest management rationality can be carried out by building partnerships and collaboration local community around forest areas. The real program can be carried out by expanding community legal access into forest areas. Optimal forest utilization will increase benefits and revenue forest management unit.

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