



ANALYSIS OF PROJECT RISK MANAGEMENT PRACTICE IN PUBLIC TIMBER FORESTRY PROJECTS: CASE OF THE NATIONAL TIMBER OFFICE IN BENIN

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration between both authors. Author BSH designed the study, did the field study, gathered the initial data and performed preliminary data analysis. Author BSH managed the literature searches and produced the initial draft. Author BGH provided guidance for writing the protocol and the study model as part of Hounkpèvi's M. Sc. Thesis work which he supervised. He provided additional literature, as well as insights for data interpretation. Both authors read and approved the final manuscript.

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ABSTRACT

Knowledge and practice of project risk management are crucial today for the success of agricultural projects which usually require huge investment and operational costs. They are key to securing profits for investors and social benefits for communities. Risk management is embedded in the project cycle. It is a cross-cutting issue, from project design to implementation, mid-term evaluation and conclusion and it can be investigated by referring to some generic theoretical variables, as described in the workflow diagram of project risk management. This article examined the extent to which the practice of risk management in a community resource-based forestry project in Benin complies with the best practice. An empirical model, based on indicators of those variables, was therefore designed to analyze the case. The project is being implemented by the National Timber Office (ONAB) of Benin and the research was done at its mid-term evaluation. Twenty (20) high-level project's technical staffs were interviewed to elicit data on operational indicators of above variables and to rate the current practice against the best practice. A composite project risk management index, combining the declared risks, their frequencies and the extent of mitigation strategies, was calculated for the purpose. The index observed value is 0.349 or 34.9%, compared to the theoretical maximum of 100%. Therefore, the risk management practice so far in the project is weak. The main reasons include lack of information on project's benefits for communities, lack of technical and social feasibility study, heavy administrative procedures during implementation and lack of training for project staff on project risk management. The study calls for greater strategic planning and better training to enhance risk management in community-based forestry projects.

Keywords: Risks; risk factor; project risk analysis; forestry; composite risk management index.

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1. INTRODUCTION

1.1 Background of the Study

Entrepreneurship and project management are the foundation of economic competition among enterprises, in the search for increased and sustainable profits. Indeed an enterprise is a project in itself and competition between entrepreneurs depends on many factors that can be summarized by differences between individual preferences (risk aversion, rate of time preference and disutility of effort) and endowments (ability, creativity, judgment, information and wealth). Also, since consumers own technology, they can have different endowments of production technology or transaction methods [1].

However, competitiveness is being hampered by more production constraints and complex consumers' demand for product quality and supply services, whereby products' cycles become shorter than ever before. In this context, successful management in order to achieve projects' objectives and meet consumers' demand becomes a matter of uncertainty monitoring and control. This pertains to risk management, which has become a critical area of business management and has attracted recently the highest attention in many industries [2]. Although many development organizations acquired substantial mastery of project management principles, poor results and low impacts among beneficiaries revealed that little attention was paid to risk management [3]. Project risk management is considered as embedded in the project cycle. It is a cross-cutting issue, from project design to implementation, mid-term evaluation and conclusion [4]. This article examines the extent to which the practice of risk management in a community resource-based forestry project in Benin complies with the best practice.

In 1990, about 7.8 million hectares or 70% of Benin country area were covered with various sorts of forest species, of which only 200 000 ha represent economically useful species and constitute the country's timber reserve [5]. Since then, natural forests have largely disappeared as a result of uncontrolled fire wood harvesting, illicit charcoal production and the expansion of cotton cultivation through inappropriate farming practices. In 1998 total area covered by forest ecosystems was estimated at 2,682,885 ha (i.e. about 22.5% of the country's area), of which classified forests, national parks and plantations represent respectively 48.6%, 29% and 0,2% [6]. Indeed, today about 100 000 ha are destroyed every year for those purposes, although the affected zones are under national forest reserves protection laws [6].

However, public and private tree plantations have increased in space, with various timber and non-timber species. The forestry sector (including timber and non-timber products) contributed 6.64% to GDP over the 2003-2005 period. This corresponds to an added value of 143.96 billions FCFA [7]. That contribution is quite low compared for example to the cotton sub-sector which alone represented 13% of the country's GDP in 2009 and 70-80% of the country's export earnings [8,9].

The above data indicate that tree planting for commercial purposes is still in its infancy in Benin, due to the lack of clear regulations and incentives for the private sector. The forest administration is represented by the General Directorate for Forest and Natural Resources which is in charge of forestry policy and regulations. Besides this administration, is the National Timber Office (ONAB), a state company which was created in 1983 for timber commercialization [6]. Until 2011, ONAB managed 14 000 ha of teak plantations installed from 1949 to 1962 under French colonization, and later from 1985 to 1995 [7]. Since 2011, the Office engaged in increasing its potential in commercial tree plantations for timber exploitation and sale and therefore launched a 5-year plantation project which intends to raise annually 1000 ha of timber trees over the 2011-2016 period [10].

1.2 Focus and Objectives of the Study

This paper aims to analyze project risk management under the above 5-year tree plantation project which is being implemented by National Timber Office (ONAB) to reach 5000 ha in 2016. The analysis will use the theoretical background and the methodology developed in the following sections. Its model relies on the workflow diagram of project risk management, and the risk management process in the project life-cycle.

The National Timber Office (ONAB) is a state enterprise with industrial and commercial mandate and is endowed with financial and managerial autonomy. Under the overall authority of the General Directorate, its main mission is to ensure sustainable management of state forest reserves. This also includes the commercialization of timber and other forest products [10].

The five-year tree plantation program is funded with the proceeds of timber sales from the forest reserves located in many regions of the country. The social context of government forest reserve management by ONAB is characterized by threats of criminal bush

fire and other forms of sabotage by neighboring populations who claim that their interests have not been enough taken into account by the forest administration [10]. Considering the ad hoc decision-making approach during the project's implementation, it is likely that a risk management plan was not adopted. Inappropriate planning and inadequate funding of activities was observed. Which alternative management strategies does this state enterprise develop then to address the above risks? Are such strategies likely to enable as successful completion of the 5-year tree plantation program? Referring to the best or recommended practices, how can risk management be improved to better achieve the program's objectives?

This paper aims to compare risk management practices in ONAB's 5-year tree plantation program, with reference to best practices in project risk management. For that purpose, field data were collected through interviews with key project staff members on existing project risks and their frequencies and mitigation strategies. A composite risk management index is then calculated to assess the gap from best practices or principles.

2. THEORETICAL AND CONCEPTUAL BACKGROUND

2.1 The Risk Management Concept

A risk is an event with bad outcome that can be identified and quantified before it occurs, thereby enabling the design of risk avoidance or mitigation strategies [2,4]. A risk is traditionally formalized from three concepts: Risk factor, risk criticality and vulnerability to risk [11]. A risk factor is a probable cause of risk. Criticality is a combination of quantifiable characteristics, including severity and probability of occurrence and/or detection. Severity is the degree of spread of the undesired event on project objectives. Probability expresses the likelihood that it happens [12]. Depending on whether or not a probability can be attributed to the event, risk may be also understood as a hazard, an unforeseen outcome. Syllepse Conseil [13] defines project-risk as the possibility that a project's implementation does not meet the expectations of achievement, cost and delivery specifications. It is associated with uncertainty while its occurrence may badly affect the project's results [2].

Risks may be characterized by their nature or their source. Risk nature may be technical (with reference to solution complexity), financial (in relation with project's financial mechanisms), human (in relation

with social conflicts, stakeholders availability) or organizational/managerial (decision-making processes, inconsistencies in deliverables' description, non-availability of resources). As to their source, risk may be also described as regulatory, juridical or commercial [13].

Risk management consists in the evaluation and anticipation of risks, as well as the putting in place of a systematic data collection and surveillance system in order to set timely warnings [14]. It is also a process of risk data processing, monitoring and stocking, as well as actions taken to mitigate the risks. Project risk analysis and management is a process which enables the analysis and management of the risks associated with a project. Properly undertaken, it will increase the likelihood of successful completion of a project to cost, time and performance objectives. It is particularly advisable to use it when there are specific target that must be met, when there is an unexpected new development in a project, at points of change in the life-cycle of a project [11].

It should go beyond data processing routine and be part of the enterprise's strategic management or policy where risks are analyzed in the framework of a continuous and iterative action line [2]. It is recognized today as one of the key determinants of project success or failure. Stakeholders' conviction of and resource endowment to address risk management is critical in this respect. Mere prediction of undesirable events will not make a great difference in project risk management, but rather preparing adequately to face them if their probability is high enough to deserve such attention [15]. After its introduction in the banking and insurance sectors of USA in the late 50s, with a focus on the probability of financial losses, it evolved in the 80s in many other sectors, with greater attention to the impacts of risk factors on project deadlines and quality and costs of deliverables. Moving from implicit project routine, risk management is nowadays formalized in well-defined risk avoidance or mitigation plans, considering the damages of not doing so that may be caused to large or strategic public projects [16].

2.2 Methods and Tools for Risk Management

Risk management is considered as an important component of quality control in project management [17]. Fig. 1 shows the theoretical approach or overall best practice for project risk management. Two main phases can be distinguished, with the steps that compose them: Risk assessment or analysis (risk identification, risk analysis, risk prioritization) and risk control or management (risk strategy, risk action

and risk closure) [11]. Earlier, Courtot [18] defined a methodology which is based on a continuous and iterative process including project risks identification and characterization (description), analysis, monitoring and related lessons learning and stock-taking.

Risks identification and characterization is a full census of existing risks by means of documentation, expert interviews, brainstorming, previous projects' database reviews and formal questionnaires. The risks are then classified, e.g. by type of causes for better action orienting. Risk analysis is geared to knowing their impacts on costs, deadlines and deliverables. Emphasis is put on risk level or criticality assessment using a 1-4 scale either in risk probability or severity. Based on this assessment, risks may be classified as low, acceptable (moderate) or non-acceptable (high) [18,12,2]. Risks mitigation efforts and costs should be commensurate with their criticality, as reflected in that classification, whereby overall risk exposure is assessed and impacts on project objectives are genuinely predicted and handled [19]. The other steps in the risk management methodology are extensively described by these authors. Overall, qualitative and quantitative methods are combined to identify and assess the causes and consequences of project risks. Cost-effective risk avoidance and mitigation strategies (prevention, correction, reduction, shifting or sharing) will heavily rely on the above methodology [15]. Fig. 2 summarizes the process of risk management, as embedded in the project cycle [18,19,12].

3. METHODOLOGY

3.1 The Empirical Model Framework and Operational Variables

The methodology adopted in this paper is based on the theoretical model in Fig. 1 which describes the workflow diagram of project risk management [11] and on the process of risk management as embedded in the project life-cycle (Fig. 2) [18,12,19]. Variables pertaining to the stages of risk identification, risk prioritization, risk strategy and risk action in the workflow are considered as basic or generic risk management variables for this study. A semi-quantitative method was applied in this research, with the goal to compare current risk management practice in the project with the best practice principles. Therefore, the theoretical model is empirically interpreted by identifying relevant operational variables that can be elicited from the case studied. On the one hand, basic variables for the analysis include project risks, mitigation strategies developed

during project implementation and corrective actions. Table 1 presents the project risks identified, together with their main causes and suggested actions to address them. The risks' frequencies are calculated later (Results section, Table 2). On the other hand, the critical research variable is the level of project risk management, which is operationalized by the composite risk management index, with reference to the best practice. This index combines risk frequencies and score achieved for mitigation strategies and actions. The detailed method of calculation is presented in section 3.3 and Table 3 reports the results. The hypothesis that current practice is far below the best practice will be verified. For decision-making in this regard, it would be good to do a Student's T-test for means comparison with regard to a reference value for risk management index in community-based forestry projects or rain-fed agriculture in general in Sub-Saharan Africa. We could not do this because such reference value could not be found in relevant publications. Nonetheless, we consider that if the calculated risk management index falls below 0.5 or 50%, it will be taken as low and the hypothesis will be accepted.

3.2 Sampling and Data Collection Methods

The study sample is made of 20 high-level technical staff members (5 senior managers, 5 technical team leaders and 10 technicians) at the ONAB's General Directorate. They were purposively selected and interviewed according to their positions, which are deemed relevant to apprehending project risk management. Indeed, senior managers are responsible for project design and high-level monitoring and evaluation, team leaders are in charge of operational management and oversee project implementation and technicians coordinate project's field works. Therefore, interviews were conducted with that sample using an interview guide to elicit the primary data on the relevant basic variables in the project risk management model (Figs. 1 and 2). Interviewees' perceptions about project risks, mitigation strategies developed by ONAB and outcomes thereof were recorded and analyzed. Primary data obtained were then processed to calculate the composite risk management index as an aggregated score of all operational variables described in the previous section.

Although the sample size is small, it is acceptable in social sciences, especially in cases like this where purposive sampling (rather than random sampling) can be made for certain kinds of investigations and non-parametric test can be conducted [20,21].

In this research, Libraries of UNDP, World Bank and EU offices in Benin were also visited to elicit useful secondary data and information pertaining to project management in general and project risk management in Benin in particular.

3.3 Calculation of the Composite Risk Management Index

Put:

- i = a project risk
- a = number of actions to be anticipated to address/mitigate that risk;
- b = number of actions actually undertaken out of the anticipated ones
- f_i = frequency of the risk (as perceived by interviewees)

If S_i is the score achieved in managing a project risk, S_r the sum of scores achieved in managing all project risks, and S_t the theoretical score corresponding to the best practices in project risk management, then the composite project risk management index (I) is calculated as follows:

$$I = \frac{S_r}{S_t}$$

I = Sr/St,

Where $S_r = \sum S_i$, with $i = 1 \dots 9$,

And $S_i = f_i * (b/a)$. The “b/a” ratio is like a weight to adjust the risk frequency with its management performance (see later in the method for calculating “a” and “b” values).

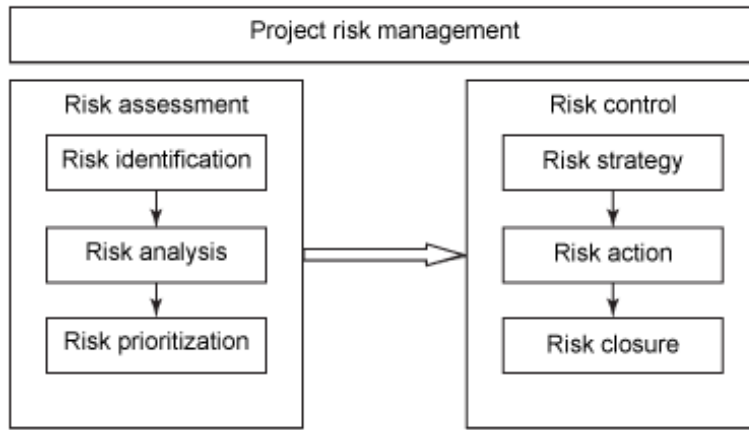


Fig. 1. Workflow diagram of project risk management

Sources: Norris C. Perry J. Simon P. 2000. [11] and <http://www.ibm.com/developerworks/rational/library/risk-risk-action-work-items/>

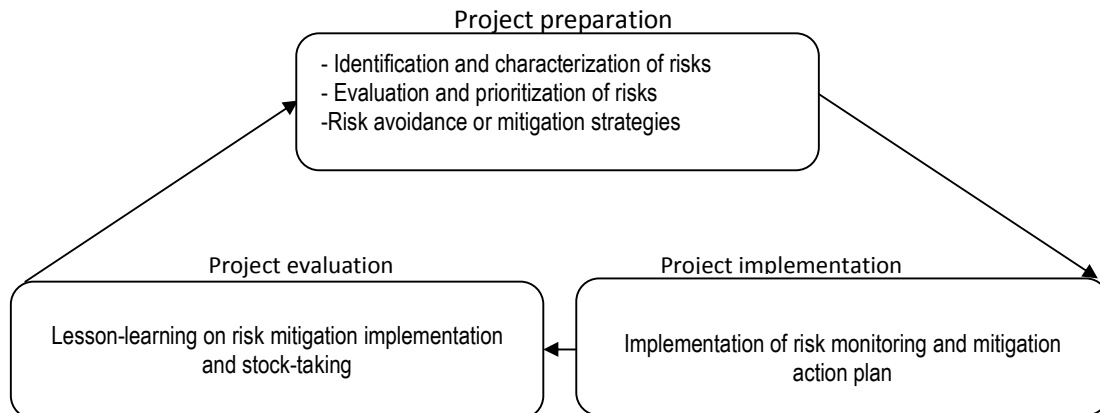


Fig. 2. Risk management process in the project life-cycle

Source: Adapted from Courtot H. (1998) [18], Maders HP. Masselin JL. (2009) [12] and Pawel P. (2001) [19]

Table 1. Project risks, their causes, mitigation strategies developed and corrective actions suggested by interviewees

Project risks	Main causes (risk factors)	Mitigation strategies developed	Corrective actions suggested
<i>Steady destruction of plantations</i>	Bush fire for agricultural land clearing near tree plantations	Sensitization on bush fire avoidance	Delineation of annual crops and homesteads zones for the populations
<i>Sabotage of project activities by populations</i>	Construction of homesteads within the plantation fields and growing of annual crops	Use of the Tunja system whereby crops are grown every two years within the tree plantations	Delineation of annual crops and homesteads zones for the populations
<i>Failure of the participatory approach</i>	Lack of labor on two sites among three due to populations resistance to project actions	Importation of labor from outside the project site	Sensitization of populations on the project's benefits and call for their participation
<i>Delay in acquisition of project's material resources (assets)</i>	Delayed market tendering and bidding for purchasing seed bags, site preparation studies, etc.	Suspension of current tendering procedure, and contingent procurement planning to avoid it	Early launching of tenders, at least one year before the tree planting season
<i>Inadequate species (teak) for tree plantations in the project's zone</i>	Inadequate research	Recovery of areas planted to teak and progressive replacement by the Gmélina species	Re-conduct soil studies to identify appropriate tree species for the project's zone
<i>Climate vagaries</i>	Rainfall-dependent tree planting	No strategy	No action suggested
<i>Increase in project costs</i>	Insufficient equipment and sine die heavy equipment purchase for mechanic land clearing	Hiring of equipment to avoid disruption in project activities and to meet deadlines	Sensitization of populations on project's benefits and to participate in project's activities
<i>Disruption of funding in case of low turnover</i>	Uncertain funding sources	Ad hoc funds request from national budget	Revision of partnership agreements with donors
<i>Heavy administrative procedures and delays in funds' disbursement</i>	Top-down management style	No strategy	Appropriate planning

References of the composite index (I) in the literature can be found with UNDP (1997) [22] and Lonergan et al. [23], respectively in the calculation of the human development index (HDI) and the index of human insecurity (IHI). Taking individual scores from a large array of elementary variables characterizing the phenomenon being studied (human development or human insecurity), each of those composite indexes is calculated as:

$$\text{Index} = \frac{(\text{Achieved score} - \text{Minimum score})}{(\text{Maximum score} - \text{Minimum score})}$$

In the case of project risk management, Minimum score = 0 (zero best practice) and Maximum score =

Theoretical score of the complete best practice, then:

$$\text{Index} = \frac{\text{Achieved score}}{\text{Theoretical score}}$$

As explained earlier, the achieved score (Sr) is a total obtained over a series of elementary project risk management variables (each with its individual score S_j). The theoretical score is the expected score from complete best practice (St). Finally, the index value is comprised between 0 and 1, the maximum (1) indicating a perfect agreement with the best practice in risk management. Values can be also converted to percentages (%).

Calculation of a and b values.

Project risk management consists in three main groups of actions, including: Risk identification; risk evaluation (analysis and prioritization) by combining risk probability and risk acuteness and risk mitigation strategy (Fig. 1). Therefore the “a” value would be 3, indicating a theoretical maximum achievement, each major action having got the value 1. The “b” value is calculated as $b=j+e+p$, where j is actual value obtained for identification, e for evaluation and p for risk coping or mitigation strategy.

These partial absolute scores are comprised between 0 and 1. They were obtained as a result of marks given by the interviewees to each of those main risk management actions, which were rated against the best or recommended practice. The latter assumes some kind of theoretical evaluation, although not always congruent with the best practice prescriptions.

4. RESULTS AND DISCUSSIONS

Table 2 presents the potential risks declared by the interviewees and their frequencies. The risk factors explaining their occurrence were already mentioned in Table 1. The main risk factor associated with each risk was declared by interviewees and was confirmed from several ONAB reports. Scores achieved in project risk management, as derived from risk frequencies and a-and b values are presented in Table 3. The absolute total score achieved (Sr) is 217, against the theoretical score (St) of 621, according to the best practices of risk management (i.e. $a = b = 1$ and $St = \sum fi = 621$). Therefore, the composite risk management index is $I = Sr/St = 0.349 = 34.9\%$.

This value of the risk management index is low, compared to the theoretical maximum (100%). In addition to overall lack of preparedness for the implementation of this project, some other reasons that would explain the low index value include the following:

- Only 5% of interviewees were acquainted with the theoretical or best practices of project risk management.
- Investment and operational costs have unexpectedly increased as a result of low growth of teak trees and insufficient replacements being effected with Gmélina trees. In 2013, only 104 ha were replanted with Gmélina.
- The unexpected increase in project costs and the use of mechanical land clearing method, as

Table 2. Project risks and their frequencies

Project risk (xi)	Number of respondents	Frequency (f) (%)
Bush fire (x ₁)	19	93
Sabotage by neighboring populations (x ₂)	19	93
Failure of the participatory approach (x ₃)	17	86
Delay in material resources procurement (x ₄)	15	75
Inadequate species for tree plantations in the area (x ₅)	14	71
Climatic risk (x ₆)	13	65
Increase in project costs (x ₇)	10	50
Disruption of funding in case of low turnover (x ₈)	9	45
Heavy administrative procedures and delays in funds' disbursement (x ₉)	9	43

Table 3. Calculation of the composite project risk management index

Risk (x)	Number of risk management actions actually undertaken*	b-value = j+e+p	Theoretical Score (St=f)**	Achieved score Sr= f(b/a) ***
x ₁	j= 0,5 (project document prepared and submitted to donor but not approved for external funding), e=0 (no evaluation is made), p=0,5	1.0	45	15
x ₂	j= 0,6 (project management strategy based on participatory approach), e=0 (no evaluation), p=0,5 (sensitization of populations was conducted)	1.1	86	32
x ₃	j= 0,6 (program management strategy based on participatory approach), e=0 (no evaluation), p=0,5 (sensitization against bush fire)	1.1	93	34
x ₄	j= 0,6 (existence of a plantation protection unit), e=0 (no evaluation), p=0,5 (control and repression)	1.1	93	34
x ₅	j= 0,4 (use of heavy machine without prior planning), e=0,4 (less than average need assessment), p=0,4 (late preparation of business plan)	1.2	50	20
x ₆	j = 0,4 (acquaintance of slow public tendering for equipment purchasing), e=0 (no evaluation), p=0,3 (existence of annual plan for tendering but not applied)	0.7	75	18
x ₇	j = 0,3 (non-adequate growth of existing teak trees), e=0,3 (low probability) p=0	0.6	71	14
x ₈	j = 0,2 (program management with routine procedures of ONAB), e=0 (no evaluation), p=0,3 (less stringent funds disbursement procedures)	0.5	43	07
x ₉	j = 0,8 (acquaintance of participants of the seasonal nature of tree planting activities), e=0,4 (knowledge of theoretical probability of rainy seasons), p=0,8 (proper planning of implementation)	2.0	65	43
Total		-	621	217
Project risk management index (I = Sr/St)			0.349 = 34.3%	

* j = risk identification, e = risk evaluation, p = risk coping or mitigation strategy;

** For the theoretical score $St = f*(b/a) = f$, as $a=b=1$ (perfect application of the best practices);

*** a-value = number of anticipated risk mitigation actions = 3 for each risk

populations refused to offer labor. This reveals the failure of the participatory approach, which the project was supposed to rely on.

All the foregoing underscores insufficient knowledge and inadequate practice of project risk management. The results also highlight the lack of preliminary technical feasibility study and proper planning.

5. CONCLUSIONS AND POLICY IMPLICATIONS

The study revealed that the practice of project risk management is weak in the ONAB community-based forestry project and does not guarantee the achievement of quality, cost and deadline objectives. Risk management has not been genuinely considered

at each phase of the project cycle. Ad hoc decision-making to cope with inadequate planning and biased application of the participatory approach in community-based forestry management has led to non-adhesion of populations to project activities and a large increase in project costs while the project goal for the first phase remained far to be reached. Although the planned acreage of tree plantations was reached, inadequate tree species were planted in inappropriate zones. Community inclusiveness was neglected and sustainability of the tree plantations is threatened. At the beginning, the project was supposed to involve joint application of the participatory approach in the field and public-private partnership in the sourcing of funds for overall project implementation. In the practice, this could not work because conflictual goals (community versus commercial) were not adequately balanced through the required information on project benefits for communities and the joint commitment needed from project partners since the beginning. Decision-making relied on heavy administrative procedures pertaining to state enterprises in Benin. Such a setting jeopardizes the application of project risk management principles, although a few technical staff members were acquainted with them.

Therefore, more than ordinary commercial projects, the implementation of community-based forestry project management requires adequate research to establish technical and social feasibility and to clarify the benefits for the communities and how such benefits would accrue to them. A particular attention should be paid to populations' food security and their needs for non-timber forest products. Hiding commercial goals and pretending a participatory approach whereby communities are dubbed in spurious and verbal agreements, is an opened avenue for high risks and final failure of public forest plantations projects. In order to avoid this, populations should be sensitized on environmental benefits and be involved in the technical design (at least site selection) of the project, qualified staff should be appointed for the project and trained on project risk management, formal contracts should be established with private funds providers, as well as with communities whose natural resource-base is to be exploited for commercial goals. Guidelines should be also prepared to monitor implementation and dispensation of benefits to all stakeholders.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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