

Use of Soil Information in the National Greening Program of DENR Region IV-A, Philippines

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ABSTRACT

Soil is one of the most important factor affecting tree survival, growth and development. In view of this, a study was conducted to assess the use of soil information in the National Greening Program (NGP) of the Department of Environment and Natural Resources (DENR) Region IV-A, a project enacted on February 26, 2011 by President Benigno S. Aquino III through Executive Order 26. Specifically, it determined the extent of use of the soil information in the project implementation and measured the value placed by DENR personnel to such information. Through the use of purposive sampling, 20 key DENR personnel involved in the NGP were interviewed. The data collected were compiled in spreadsheet and analyzed using Statistical Package for Social Science (SPSS).

Results showed that 45% of the total respondents conducted site characterization prior to the NGP implementation. The results also indicated that the NGP personnel fertilized the soil even without prior soil fertility information. Likewise, result from the soil information-indicative relationship survey indicated that DENR staff place a higher value to soil chemical properties (soil pH; Nitrogen, Phosphorous, and Potassium content; and soil organic matter) over physical and biological characteristics. With the significance of soil properties in the survival, growth and development of trees, it is highly recommended that the DENR maximize the use of soil information in their reforestation program.

Keywords: CALABARZON, Executive Order No. 26, purposive sampling, site characterization, soil properties

INTRODUCTION

Forest is an enormous tract of land where trees are the most dominant biotic organisms. It is important to humans since it provides natural resources. According to Burton (2008), forest lands cover 30% of the world's land area and contribute to the economies of every country. Forests provide human needs especially those products that are important in terms of health. It serves as a large biological filter that purifies air and water. It is also a large oxygen tank that restores oxygen in the atmosphere through photosynthesis. Forest is a key element that provides assistance in maintaining the ecological balance by acting as a natural buffer (Gottle and Sene 1997).

According to Forest Management Bureau (FMB, 2012), 52.7% of the land area in the Philippines is classified as forest lands. Unfortunately, a large part of these forestlands are being utilized. As stated by Agpaoa *et al.* (1976), natural forest management and reforestation together with erosion control in denuded areas are the main pillars for Philippine forestry to

prosper. In relation to this, the Department of Environment and Natural Resources (DENR) launched reforestation, afforestation and forest protection programs to proactively prevent degradation of the forestlands.

The DENR which is “.. the primary government agency responsible for the conservation, management, development, and proper use of the country's environment and natural resources, specifically forest...” as stated in Executive Order (EO) No. 192, prioritizes the integrity of the environment and climate change through the National Greening Program (NGP). NGP was enacted on February 26, 2011 by President Benigno S. Aquino III through Executive Order 26. It is a massive rehabilitation program of the government with the goal of planting 1.5 billion trees in 1.5 million ha of land nationwide within a six-year span. This program aims to provide human security by increasing household income and enhancing environmental awareness through the community. It also intends to offer economic security by amplifying awareness on the new technologies, business developments and additional production of crops and forest-based materials. Furthermore, NGP aspires to ecological security by improving environmental stability for wellness of ecology and humanity (DENR 2011).

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Prior to any NGP implementation, survey, mapping and planning (SMP) activities are conducted. During this phase, characterization of the project site is done vis-a-vis biotic, physiographic, climatic, anthropogenic and edaphic aspects. Therefore, soil information is important in the establishment of forests or any reforestation project because of the intimate contact between the plant and the soil. Soil is a major factor in determining the relative distribution and abundance of plant species within the area (Bear 1965).

However, of all these factors, the edaphic information is usually neglected. Soil plays important roles in our ecosystem. According to Brady (2008), soil functions as a medium that sustains plant growth. It is also one of the factors that control the hydrologic cycle. It provides decomposition that regulates the nature's recycling system. Soil serves as habitat for small organisms which influences the atmosphere by giving off and taking up oxygen and carbon dioxide.

The National Greening Program is a critical project that needs to be monitored from start to finish. If this will not be implemented correctly, the government resources will just be wasted. Critical to its success is a careful account of all information from the project site. This study focused on determining the extent of use of soil information by DENR personnel in the NGP.

EO 26 has its own set of objectives to be achieved in a given span of time. It is to provide human, economic and ecological security which will have a great impact on the environment and society. Through this study, information about the NGP will be provided along with survey results, mapping and planning from the past two years. This study will determine how edaphic information are used in the government reforestation program in Region IV-A, the area covered by the provinces of Cavite, Laguna, Batangas, Rizal, and Quezon (CALABARZON). Further, strategies/approaches are recommended to increase the integration of soil information in government reforestation projects. The results of this study would be useful for future planning purposes of reforestation programs.

MATERIALS AND METHODS

Site Selection

The study was conducted in Region IV-A. One of the criteria of the site selection is proximity to the UPLB to facilitate the conduct of the survey. Accessibility to the data source was also taken into consideration.

Data Collection and Analysis

Data collection used a survey questionnaire capturing the status of the NGP and the practices used before or during the planning of the project, including the species selection and the site characterization that DENR considered for the program. The questionnaires were distributed through the DENR central

office to the PENROs and CENROs in CALABARZON. There were two respondents from PENRO /CENRO Laguna, eight respondents from PENRO/CENRO Cavite, four respondents from PENRO/CENRO Rizal, two from PENRO Quezon and CENRO Pagbilao, Quezon, and there were four respondents from PENRO Batangas and CENRO Calaca, Batangas. Respondents were selected to represent each province. The available team leaders or project leaders were prioritized as respondents. The team leaders are those who are knowledgeable on the project. In this case, purposive sampling was used since selection of the respondents are based on a set of criteria which includes their knowledge of the project, availability, and willingness to participate in the study.

Secondary data such as annual reports and SMPs were obtained to support the interviews with the projects leaders in each province.

The interviews were held every Monday between May and August 2014 since the informants were on field from Tuesdays to Fridays. The first month was spent following up the memorandum order from Regional Office to the PENROs. The interviews were held during the following months.

The data were analyzed using the Statistical Package for Social Science (SPSS). The respondents' answers were collated by province and codes were assigned to each response in a spreadsheet. Descriptive statistics were then generated from the data set.

RESULTS AND DISCUSSION

Respondents' Profile

The CALABARZON region has a large area devoted to the NGP. Each of the sites are supervised by personnel from the PENRO and CENRO. Using purposive sampling, 20 respondents were identified. The selected respondents (Figure 1) had designations such as chiefs of Forest Management Services (FMS) (20%), provincial coordinators (10%), or project leaders (70%). The FMS chiefs serve as overall supervisor of the provincial coordinators, who are in-charge of addressing issues within their province, and the project leaders assign tasks on field and prepare project progress reports.

Information about the NGP Sites

Each respondent manages different project sites in different provinces. Each project was given seedlings and working budgets depending on the size of the reforestation site. Based on the respondents, for every hectare, 500 seedlings were given to the project. Each project is divided into phases: establishment, maintenance, and protection. Funds were allocated for each phase. On the average, for the establishment phase, the annual budget allocation is PhP 2,500 ha⁻¹. The maintenance and protection phases receive PhP 3,000 ha⁻¹ annually.

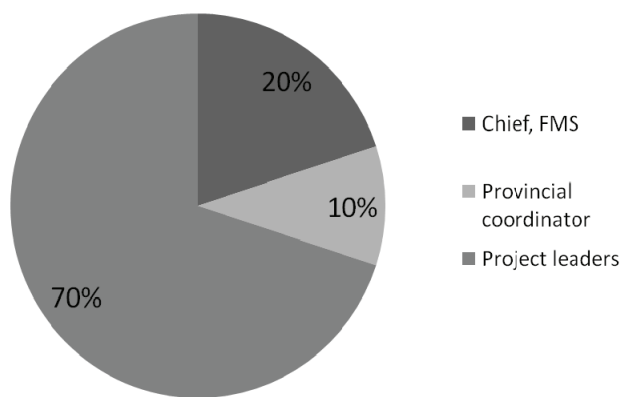


Figure 1. Profile of the 20 DENR Region IV-A personnel involved in the NGP implementation that were interviewed in the study.

The age of the stand managed by the respondents ranges from 4 to 41 months. Some of the projects have just started at the time of the interview. Seventy percent of the sample indicated an average of 15% mortality in the project site. The lowest recorded mortality rate is 6% and the highest is 30%. Plant growth depends on different environmental factors. These environmental factors are nutrient supply, availability of moisture, temperature and intensity, quality and duration of light (Porter 1991). In order to maintain growth, the demand must be satisfied by the supply (Loomis 1898). It only implies that in order to achieve a successful reforestation or any planting project, the plants must receive the supplies they need to grow and develop. The annual accomplishment reports, however, show that the seedlings “that did not survive” were replaced during the maintenance and protection operation.

Two types of species are categorized in the survey, the native species and the exotic species. Seventeen respondents (85%) indicated the use of native species alone in their NGP site while three respondents (15%) used both native and exotic species. In general, the species used in all the NGP sites surveyed are classified into eight groups: indigenous trees (31%), rattan (7%), rubber trees (2%), fuel wood (17%), fruit trees (26%), mangroves (10%), bamboo (2%), and mahogany (4.8%) (Figure 2). Most of the respondents (46%) specified “referring to existing vegetation” as a basis for their species selection. Other bases were “use existing records” (24%), and “choices of the community” (15%) for species selection. Only 3% referred to the result of soil analysis for determining what species to plant (Figure 3). Consequently, most planted species are indigenous trees and fruit trees. Since the NGP is a community-based program, the community is given the privilege to choose what species to plant and they prefer fruit trees as sources of food and income.

Site Characterization in the NGP

Site characterization is an important part in planning reforestation projects. In this phase, a complete description of

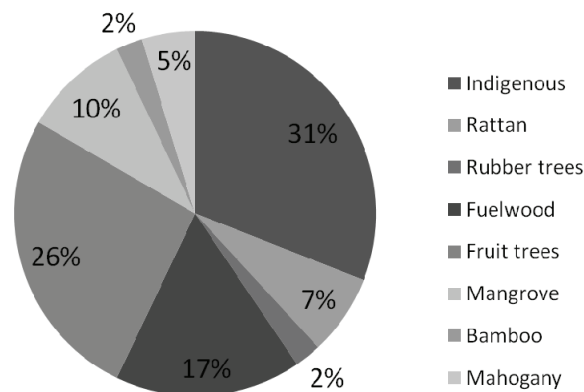


Figure 2. Type of tree/plant species planted in the NGP of DENR Region IV-A (CALABARZON), Philippines.

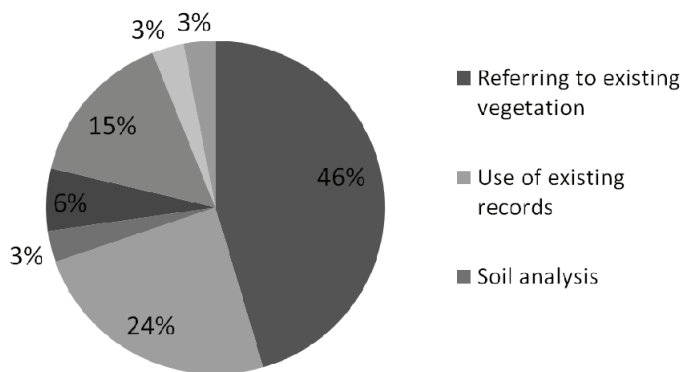


Figure 3. Bases for species selection in the NGP of DENR Region IV-A (CALABARZON), Philippines.

the study site is provided, which includes information on the edaphic, climatic, biotic, physiographic and anthropogenic features of the area. According to Agpaoa *et al.* (1976), a planting survey is essential in the initial phase of reforestation projects. Based on the survey, almost half (45%) of the respondents indicated that they are conducting site characterization in the area while the remaining (55%) do not (Figure 4).

The nine respondents (45%) who indicated initial site characterization also indicated gathering soil information (Figure 5). From the four respondents (20%) who considered soil as site factor, three respondents determined soil characteristics by soil sampling and one respondent characterized soil by using a simple soil test kit (Figure 6).

Four respondents (20%) who considered soil characterization in the project indicated that the soil had only been tested once. The soil test for chemical properties (pH and NPK) and physical properties (soil color, texture and depth) was conducted before the project planning.

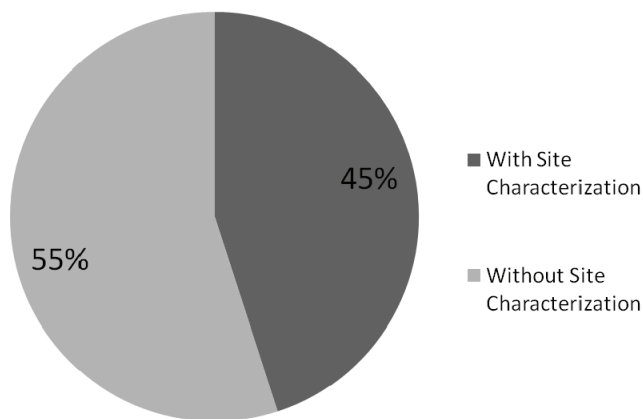


Figure 4. Percentage of the respondents that indicated the conduct of site characterization prior to the NGP implementation at DENR Region IV-A (CALABARZON), Philippines.

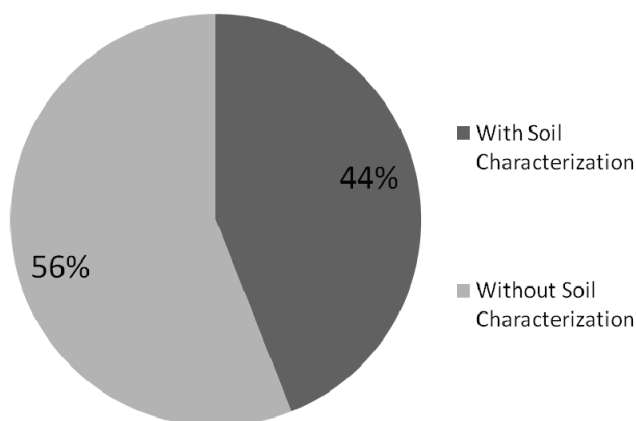


Figure 5. Soil characterization as a component of site characterization in the NGP of DENR Region IV-A (CALABARZON), Philippines.

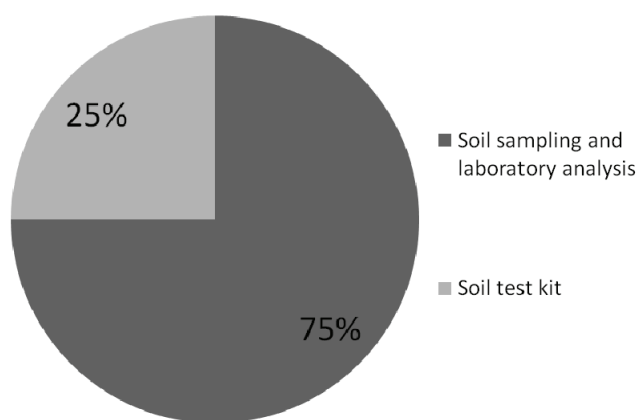


Figure 6. Ways of soil characterization in the NGP of DENR Region IV-A (CALABARZON), Philippines.

Importance and Consideration of Soil in Site Characterization

Four respondents (20%) indicated 11 properties of soil used in site characterization. The properties are: soil texture (15%), soil color (5%), soil pH (20%), bulk density (5%), soil depth (10%), Nitrogen content (20%), Phosphorus content (20%), Potassium content (20%), biological factors (5%) and the rest (80%) did not answer (Figure 7). The most considered factors are the chemical properties of the soil while the least are the physical and biological. In this project, the soil nutrient content is an essential component of soil because it is directly related to the productivity and growth of the stand. The soil fertility level is one of the factors that impact the success of the reforestation project. According to Agpaoa *et al.* (1976), soil has a large part in influencing forest establishment. Soil depth, organic matter content, moisture, availability of nutrients and pH are important soil properties that contribute to tree growth. Brady and Weil (2002) mentioned that soil testing is advisable in order to assure the growth of the plants when changes in the soil or soil amendments are done. According to Brady (2008), soil analysis is used for the nutrient management of plants. It is used in assuming the response of plants to different soil amendments happening in order to maintain the reforestation sites. Russo *et al.* (2005) reported that areas with the poorest soil have lower percent survival and growth.

Based on the study of Gebauer *et al.* (2012), soil property, like physical property, affects seedling survival through compaction that limits the root growth and aeration. A study of Russo *et al.* (2005) concluded that soil type and fertility affect plant growth and survival. In addition, a study of Breugel *et al.* (2011) indicated that soil fertility has significant effects on the early growth and survival of seedlings. Moreover, based on the study of Barcenas-Arguello *et al.* (2013), soil types affect the vegetation of an area. It is unfortunate that few respondents consider this information in their reforestation activity. Only four respondents (20%) rated the importance of soil properties while 16 respondents (80%) did not since they do not consider soil in the site characterization phase. Most of the respondents placed high value on the chemical properties over the physical properties of soil. The neglect of soil physical properties could result to poor growth and survival of planted seedlings as they may have difficulty establishing roots and absorbing moisture if the soil is compacted or has poor water field capacity. Gebauer *et al.* (2012) observed a lower survival and growth rate in areas with highly compacted soil.

Additional Practices in the Project

Although most of the responses point to the neglect of soil characterization in site preparation, the projects still continue with additional practices such as brushing, weeding and fertilization to ensure the growth and development of the seedlings and reduce mortality to a minimum of 15%. Based on the survey, 19 respondents (95%) indicated that they are applying fertilizers as additional practices during the maintenance and protection phase of the project (Figure 8).

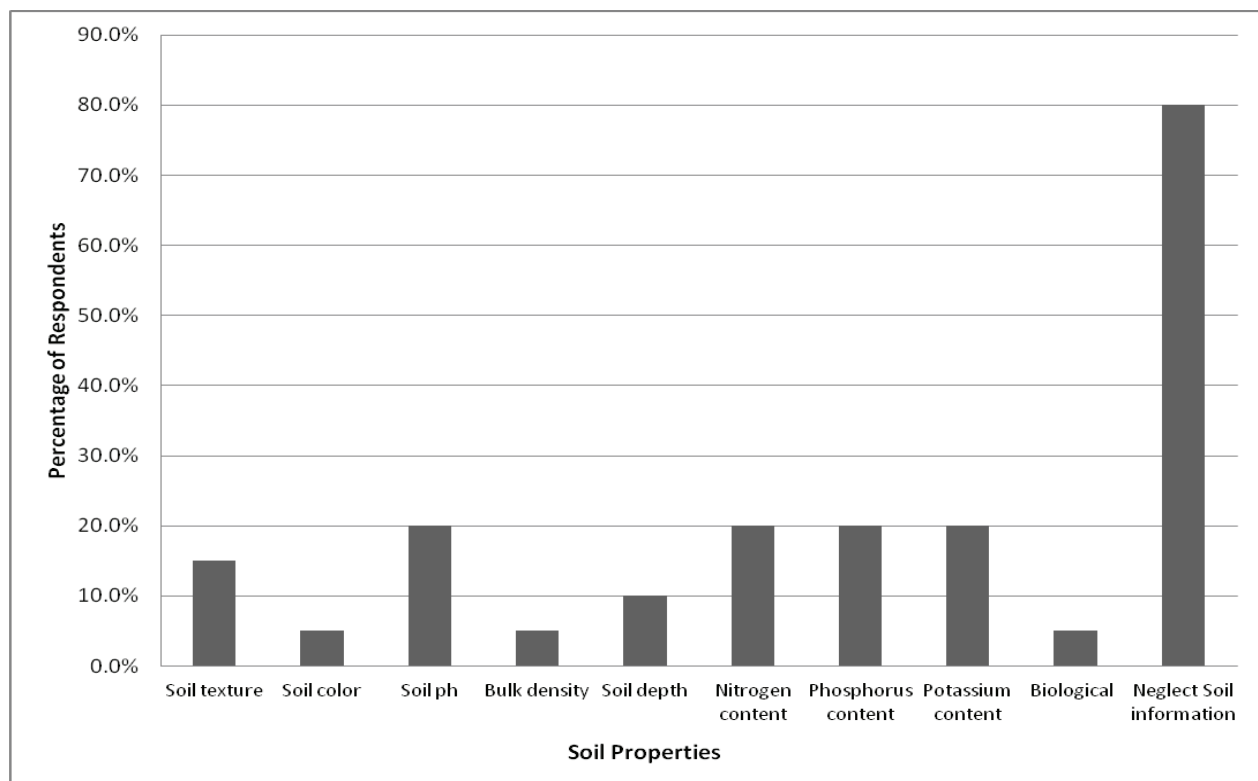


Figure 7. Soil properties tested in the NGP of DENR Region IV-A (CALABARZON), Philippines, based on interview of key DENR personnel.

Unfortunately, the type of fertilizer used was not mentioned during the survey. Majority of the respondents did not specify what practices they are doing in the NGP site.

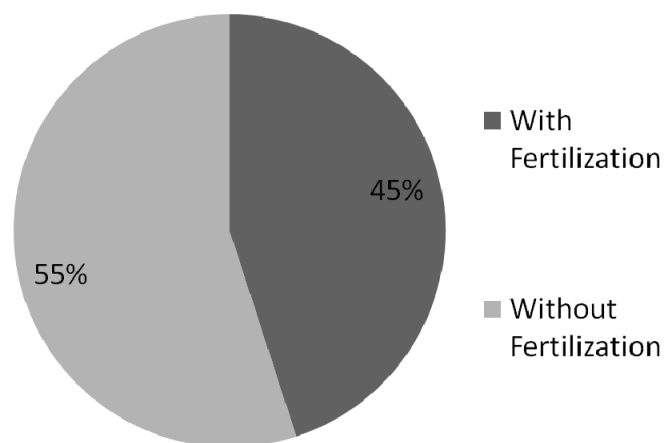


Figure 8. Percentage of the respondents that indicated the practice of fertilization in the NGP of DENR Region IV-A (CALABARZON), Philippines.

CONCLUSION

In this study, the respondents answered the questionnaire based on their knowledge on the NGP sites they are managing. Results show that only 45% of the respondents conducted site characterization while the rest did not.

Those who conducted soil characterization considered soil chemical properties (N, P, K content, organic matter, and pH); soil physical properties (color and texture); and soil biological properties (soil fauna). These information were generated through soil sampling and analysis either through the Bureau of Soils and Water Management analytical laboratory or the use of soil test kit.

The study reveals that in implementing the NGP, the DENR regional personnel interviewed only used “existing site vegetation” and “species preferred by communities” in choosing species to plant in NGP sites. Soil information is not a priority in species selection for the respondents.

Likewise, results show that only 20% of the respondents considered soil information in the project planning for NGP. Soil information is necessary to determine what additional practices such as fertilization are needed to improve the growth and ensure survival for the seedlings planted. NGP is a massive rehabilitation project with many of the planting sites described as degraded and marginal with low soil nutrients. Hence, soil characterization needs to be prioritized at the onset to determine

the appropriate species to be planted as well as the necessary silvicultural practices to ensure survival and good growth of the planted seedlings. Only then can the NGP achieve its goals of improving the country's forest cover while contributing to the local communities as well as to the national economy.

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