Nursery

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INTRODUCTION

Small-scale forestry (community-managed or individually-owned) has emerged as an important activity in the Philippines over the last decade (Harrison et al. 2001; Aggangan, 2001). Private small-scale plantings for multiple objectives (e.g. for timber production, fuelwood, food, fodder, windbreaks, soil stabilization and property demarcation) and with multiple designs (pure stand, mixed with agricultural crops, planted in blocks or scattered along homesteads, roadsides, streambanks and canals) are sporadically established and reflect the major paradigm shift of forest management by the forestry department (Mangaoang 2002). Dart et al. (2001) argued, however, that the majority of these smallholder plantings have limited success due to lack of integrated package of tree management practices. Harrison et al. (2000) stated that the standard of silviculture in smallholder farm forestry in the Philippines is low. Planting materials are generally of low quality and species planted are not matched with the ecological conditions of the planting site (Lapis et al. 2001; Herbohn et al. 2001). Gregorio et al. (2004) revealed that nursery operators' lack of knowledge on appropriate nursery cultural practices and their limited access to sources of high-quality germplasm have led the production of low-quality planting stock in most tree nurseries in Leyte. Moreover, lack of information on site and species combination and narrow species base have resulted in planting of most species in unsuitable sites resulting in poor growth performance of planted trees.

The Potential Role of Nurseries Silviculture is the manipulation of forest growth through careful design and management (Reid and Stephen 2001). Essentially, it embraces a wide assortment of treatments to include not only those management systems conducted when the seedlings are already planted but also those practices that are carried out while the seedlings are raised in the nursery. Substantial information regarding silviculture has long been available. Textbooks discussing the principles in nursery and plantation management and various publications including symposia proceedings, journals and technology transfer brochures reporting the results of nursery and silviculture-related research activities and experiences are widely published. Nonetheless, smallholders in the Philippines rarely have access to forestry offices or academic and research institution libraries where these references are kept. Further, insufficient effort has been made by relevant agencies to extend the available information to reach the level of smallholders. Consequently, there is a need to look for ways to convey the information to the smallholders and one of the potential means is by using the forest nursery as the focal point of extension. Seedling production is an integral part in most tree growing programs. Nurseries are established in order to produce seedlings, and are often a major part of most community forestry projects (Shanks and Carter 1994). Extending silvicultural advice from the nursery level is important for three reasons. First, qualities of seedlings as they are raised in the nursery largely influence their subsequent growth. Hence, it is necessary that silvicultural interventions be provided as early as while the seedlings are in the nursery. Second, smallholders prior to any tree planting activity frequently visit nurseries to obtain planting materials. In fact, most nurseries and particularly those established by community organizations serve as multipurpose centres in which community organization members convene or training by extension agents is conducted. Nurseries therefore could be used in extending silvicultural advice to a wider population before tree planting activity commences. Lastly, a nursery could showcase silvicutural technologies that smallholders could later adopt

and apply in their respective seedling production and tree management ventures. KEY FINDINGS OF THE SURVEY ON THE NURSERY SECTOR IN LEYTE PROVINCE A survey was conducted in the nursery sector of Leyte province to investigate the causes of earlier-identified constraints of limited planting stock, use of low-quality planting materials and site-species incompatibility common in smallholder tree planting efforts. A total of 74 nursery operators from 24 municipalities were identified and interviewed. Of the total number of respondents, 37 were individual operators, 22 operated communal nurseries and 15 were in-charge of nurseries established by government agencies, particularly the Department Environment and Natural Resources (DENR), Department of Agriculture (DA), Philippine National Oil Company (PNOC) and Leyte State University (LSU). This section presents the salient findings of the survey, which provides benchmark information for designing potential alternative measures to solve the impediments to availability of planting stock and proper matching of the species to the planting site.

The operators mainly use two types of germplasm: seeds and wildlings. While the majority of them prefer seeds, wildlings are commonly used because they are more available and easier to collect compared to seeds. Many timber species are fine-seeded making seed collection from the ground difficult. There is a lack of information on the phenology of various trees, particularly on indigenous species. As a result, operators are usually unable to judge the optimal time to collect seeds while these are still attached on the mother trees or when these have not fallen, germinated and anchored on the ground. A further reason for growing wildling, especially for those who are selling seedlings, is the cost-effectiveness advantage due to shorter management period in the nursery. While the use of wildlings offers these advantages, experience of the operators revealed that the use of this type of germplasm usually results to high mortality of potted seedlings and production of planting stock with deformed root systems. It was noted that collection of germplasm does not follow the standard procedure to ensure high quality. Operators

ignored the quality of mother trees during the collection process. About 64.5% and 69.2% of individual and communal nursery operators respectively, did not consider the appearance of mother trees. Although nearly all (88.6%) of the operators know the benefit of collecting germplasm from phenotypically superior trees, most of them do not take serious concern on this aspect. It was pointed that the scarcity of mother trees and limited availability of germplasm compel them to merely collect whatever is available. This could be true particularly for native species in which the supply of germplasm is often limited. However, even if there is abundant supply of germplasm as in the case of most exotics, still the physical trait of the mother tree is not paid much attention. This is a crucial aspect in tree farming considering that the physical, physiological and genetic qualities of mother trees have direct impact on subsequent growth of planted seedlings. Mulawarman (2003) stated that germplasm that is taken from healthy, mature and straight-stemmed trees would likely exhibit superior growth compared to that taken from defective trees. It is further known that the nursery operators mostly collected germplasm from few trees and the distance between the mother trees is not considered. This practice is likely to result in collection of seedlots with narrow genetic base. Dawson and Were (1997) pointed out that seeds should be collected from a minimum of 30 trees that are at least 50m apart to ensure broad genetic base. Koffa and Rosethco (1997) argued that it is important for smallholders to collect germplasm from a broad genetic base to prevent possible genetic erosion of the population of trees on the farm that will serve as future sources of germplan.

In general, the operators possess the basic skills needed to raise the seedlings. Most of the individual operators have learned these skills through trial and error while the majority of the group operators have gained the knowledge from attending formal training sessions. Nevertheless, it is apparent that the experience of the operators is limited and there is still a dearth of knowledge on proper seedling production techniques. It was observed that planting stock produced in the nurseries

is not of high quality. Three sample seedlings for each species that were available during the nursery visit were taken for destructive sampling to assess the seedling quality using three parameters – root-shoot ratio, sturdiness quotient and root morphology – as defined by Jaenicke (1999). Among the 20 species taken for destructive sampling from all nurseries, only two have desirable sturdiness quotient values of less than six. This indicates that most of the seedlings raised were basically lanky, etiolated or not robust. With regards to root-shoot ratio, all of the seedlings tested had values of less than one, which means that shoot biomass is too high compared to root biomass1. These findings indicate that the seedlings raised both in small-scale and government nurseries are of sub-optimal quality and unlikely to withstand the adverse ecological conditions in most planting sites.

The survey of the nursery sector of Leyte revealed that smallholders have limited information on germplasm sources and that there is no free flow of propagation stock. Germplasm for some species was found abundant in one location but scarce in other areas. In view of this, a farmer-based seed collection and distribution system will be established. Farmers from selected communities will collect seeds of identified species. It is envisaged that farmers would be equipped with the necessary information and skills in proper germplasm collection through their hands-on participation in running the model nurseries. The ACIAR Smallholder Forestry Project will purchase the seeds from the farmers. These will be processed, packed together with propagation instructions and distributed to farmers for their own seedling production. The project will also procure seeds of highly demanded but expensive species from certified sources to link the smallholders with the pathway where high-quality germplasm operates. The packed seeds will also reflect information printed on the packet about the appropriate planting sites for such species. This will determine whether farmers will be able to produce seedlings given the propagation instructions and whether they will plant the seedlings in accordance with their site requirements. In addition, this will establish whether the farmers will

choose the species suited to their farms if they are given a wider option of available species. The species of germplasm taken by the smallholders will be recorded and visits will be done to planting sites to assess whether the smallholder has chosen and planted the species suited for the area as indicated on the seed packs. To improve the access of smallholders on germplasm, the seed distribution centre will develop a database about germplasm sources. The location of mother trees, seed stands and seed production areas of various species will be important inputs of the database. Further, the database will indicate the time when the seeds or wildlings will be available and ready for collection.

CONCLUDING COMMENTS The nursery sector has great potential for providing extension services to landholders, particularly on providing access to high quality planting stock of a wide variety of species and information on proper site and species combination. Nursery establishment is feasible for smallholders and planting materials used in smallholder forestry systems are largely sourced from smallholder nurseries. However, with limited inputs both on financial and technical aspects, a package of support system as discussed above is needed for the sustainability of these nurseries and to harness their potential for promoting the success of smallholder forestry in Leyte Province. With improved technical skills, nursery operators will eventually become valuable extension agents for disseminating knowledge on effective nursery management and matching of the species to the planting site. Further, improving access to high-quality germplasm and income derived from seedling production will help sustain the operation of smallholder nurseries, continuously providing support services to a wider small-scale tree farmer community, such as provision of seedling production and tree planting advice, and a timely and sufficient quantity of high quality planting stock of various species.

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