Bamboo Propagation: Practical Experiences of Some Private Nursery Operators in Laguna, Philippines

By

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Abstract

Keeping in mind that the demand for bamboo propagules is increasing very fast, the author took a close look at the nursery practices of five bamboo propagators operating in the province of Laguna, the province where the foremost research organizations of the country in agriculture and forestry are located. His major findings: (1) most propagators are unaware of research findings on the use of improved methods; consequently they continue to use traditional methods that gives high survival rates but limited quantities, (2) propagators use a light weight mixture consisting of garden soil, rice hull and coconut coir as propagation medium, (3) a few propagators use growth hormones to induce root formation, and (4) they sometimes conduct research that once in a while produces surprising results. The author urges research institutions to assist bamboo nursery operators by giving them training and information materials that are easy to understand and follow.

Introduction

There is some kind of revolution going on in the Philippines right now and it involves bamboo. More and more people, NGOs, local government units (LGU), private land owners, resort managers, environmentalists and many others are increasingly getting interested in planting bamboo for various reasons (e.g. pole production, landscape beautification, erosion control, carbon sequestration, food production, bambusetum development and tourism enhancement). Consequently, the demand for planting materials has increased tremendously, prompting many enterprising individuals to go into the business of bamboo propagation.

At present, the local demand for bamboo propagules is greatest for ornamental species but that for timber or construction bamboo is expected to catch up soon because many LGUs, private landowners and companies engaged in bamboo processing are expected to put up their own plantations in the very near future.

Although much work by scientists has been accomplished in almost every country where bamboo is being planted, their research results often do not trickle down to bamboo propagators, and even if they do, many local propagators have found that some methods that work satisfactorily under experimental conditions actually do not turn out to be as effective in practice.

Because they have years of practical nursery experience, bamboo nursery operators are valuable sources of information. As the saying goes “experience is the greatest teacher”. For sure, there is much that we can learn about bamboo propagation from experienced nursery operators. For one thing, they are the most reliable judges of whether technologies developed by experimentation do really work in practice. And bear in mind, some of them also do carry out some improvisations that sometimes bring about positive results.

The province of Laguna is located at the southern portion of Metro Manila. The province is famous for its gardens that supply the landscaping plants needed by Metro Manila and nearby provinces. The

country's foremost educational and research institutions in agriculture and forestry are located in Los Baños, including the University of the Philippines at Los Baños, the Ecosystems Research and Development Bureau, the Philippine Council for Agriculture, Forestry and Resources Research and Development (PCARRD) and the Forest Products Research and Development Institute.

This paper presents a summary of what the author has learned from the experiences of nursery operators in Laguna, Philippines and his own 12 years of experience in propagating different species of bamboo.

Nurseries Included in the Survey

Name and address	Nursery size	Bamboos raised	APC**
Sardo's garden* Lalakay, Los Baños, Laguna	1,500 sq. m	ornamental	1,500
Tony's Garden*	1,500 sq. m	ornamental	1,500
Lito's Garden* Maahas, Los Baños, Laguna	2,000 sq. m	ornamental	2,000
Laguna Botanic Nursery* Timugan, Los Baños, Laguna	1,000 sq m	ornamental	1,500
CDC Bamboo Nursery Sto. Tomas, Calauan, Laguna	3,000 sq m	ornamental timber	2,000 6,000

**Also raises non-bamboo garden plants*
***APC – annual production capacity*

Note that of those included in the survey, only CDC Bamboo Nursery (or CDC for short) which is owned and operated by the author and two partners, is engaged in the production of both ornamental and timber bamboos. CDC has been in existence for less than a year.

The quantities produced by the nurseries are dependent largely on demand, especially for timber bamboos. Large quantities are not raised unless there are firm orders from customers.

Species Being Propagated

With the exception of CDC, nurseries in Laguna are involved only in the production of propagules of a few species, all ornamental. We can't blame them from specializing because ornamental bamboos are not only in high demand. They also command prices many times higher than other species. The ornamental species being propagated in large numbers include: (1) *Thyrsostachys siamensis*, (2) *Bambusa dolichomerithalla*, (3) *Bambusa multiplex* forma *variegata*, (4) *Schizostachyum brachyladum*, (5) *Bambusa vulgaris wamin* and (6) *Phyllostachys aurea*. There is much interest in producing propagules of black bamboos (*Bambusa lako* and *Gigantochloa atroviolacea*) but mother plants of these species are still quite scarce and very expensive.

Insofar as timber or construction bamboos are concerned, the emphasis has been in the raising of planting stocks of three species: *Bambusa blumeana* (Kawayan tinik), *Dendrocalamus asper* (giant bamboo) and *Bambusa merriliana* (bayog). However, small quantities of the following species are also being propagated: *B. philippinensis* and *Schizostachyum lumampao.*

Propagation Methods

By Seeds

Bamboo seeds are seldom available so like other propagators in the country and other parts of the world, bamboo propagators in Laguna rarely use seeds to produce new plants. Recently, however, one operator bought seeds of two species of black bamboo, Java black bamboo (*Gigantochloa*

atroviolacea) and Timor black bamboo (*Bambusa lako*), from eBay. He placed an order for 100 seeds for each species and sowed them immediately when they arrived. More than 50% of the Java black bamboo germinated within two weeks after sowing. No germination was obtained from Timor black bamboo; the reason could be that the seeds have lost their viability after many months of storage at the sellers' outfit.

In the Philippines, there is one species that produces flowers almost every year---*Schizostachyum brachycladum*. There has been no report, however, that seeds have been produced from clumps of the said species. Amazingly, no clump of the species has been reported to die out after flowering.

Clump Division and Offset Planting

Almost every bamboo nursery operators in Laguna uses these two traditional methods of propagation (Banik, 1995; PCARRD, 2006) to produce new planting stocks. Clump division is the most widely employed method for species that have small diameters and do attain heights greater than 2 to 3 meters such as *Bambusa multiplex*, *B. muliplex* forma *variegata* and *B. multiplex* var *riviereorum*. Clump division is carried out by using machetes or saws. The divisions are commonly planted in large plastic bags filled with a medium consisting of a mixture of decomposing rice hull, garden soil and coconut coir.

Although rice hull is nutrient poor and does not decompose easily, it is very popular among plant propagators in the Philippines because of its light weight, which makes handling and transport of potted plants easy and less costly. Another advantage is that they increase the porosity of the medium allowing air circulation to proceed easily. Because rice hull is nutrient poor, most plant propagators apply fertilizers to make their plants more vigorous and nice looking. For bamboo, the most common fertilizer is urea.

Clump division is definitely not a satisfactory technique for large scale production over short periods because it takes time for clumps to grow to a size that will make them ready for another round of division. Laguna bamboo propagators like the technique, however, because it is simple, easy to implement, cheap, and most of all, it gives 100% survival most of the time.

The use of offsets is also a favorite method for propagators of ornamental bamboo in Laguna because it offers the same advantages as the clump division method. Propagators use it for species that are bigger than those propagated by clump division and which command very high prices in the market. Thai monastery bamboo (*Thysostachys siamensis*) which sells like hot cakes in the country is propagated by offsets. Each offset consists of a rhizome and a portion of the culm cut just above the 4^{th} or 5^{th} node from the base. The offsets are planted in plastic bags filled with the medium described above and kept under partial shade until they produce new leaves. Watering is done every day and urea fertilizer is applied once a month or once every two months.

Other ornamental plants propagated by offsets in Laguna are *Bambusa dolichomerithalla*, *Schizostachyum brachyladum*, pink bamboo (probably a *Bambusa*), Australian bamboo (also probably a *Bambusa*) and *Phyllostachys aurea*, a running species.

By Culm Cuttings

Among those included in the survey, only CDC propagates bamboo by culm cuttings. The main reason for this could be that the other nursery operators have no technical background on bamboo, do not know what publications are available and have not been in contact with government extension workers. Because of their poor technical background, they find it quite difficult to understand many of the existing references. There has been very little attempt on the part of research agencies to carry out public education and information activities that would spread the technologies developed by research to reach their intended beneficiaries.

Propagation by culm cuttings is definitely an improvement over the traditional methods, i.e. clump division and offset. The principal advantage of using culm cuttings over clump division and the offset method is that more propagules can be obtained from a single culm within a matter of months.

The procedure employed by CDC in propagating culm cuttings evolved from carefully studying techniques described in various references (Anonymous (a), 1997; Anonymous (b), 1997; Banik, 1995; Lantican, 2008; PCARRD, 2006; Virtucio and Roxas, 2003). It consists of the following steps:

1. Selection of the culm to be cut
2. Cutting of the selected culm near the base
3. Trimming of the branches to 2 or 3 internode lengths
4. Cutting of the culm (with a saw) into segments consisting of 1, 2 or 3 internodes with the cut positioned 2 to 3 cm below the basal node
5. Planting of the cuttings in black polyethylene bags or in propagation plots
6. Watering of the cuttings daily at least 3 times a day.
7. Transferring the rooted cuttings

Based on the experience of the CDC, the best culms to use for culm cuttings are those that are mature and with well developed branches and lateral buds. According to Virtucio and Roxas (2003), a culm is perceived to be mature when all its culm sheaths have already fallen off. This rule of thumb would of course not work in the case of species with persistent culm sheaths such as *Thrysostachys siamensis*.

Between cuttings with branches and those only with buds, CDC's observation is that cuttings with branches give a higher percentage of rooting than those with nothing but buds. Cuttings that only have buds may root but rooting is very much longer compared to those with branches.

In terms of the number of internodes in a cutting, CDC prefers the use of single node cuttings. The cuttings are planted vertically or in a slanting position and then their cavities are filled with water. Filling the cavities with water prevents the fast drying of the cuttings, increasing their chances to produce roots.

When cuttings are made up of two or more internodes, the cuttings are buried in the soil in a horizontal position. Before they are buried, a hole is usually made in each internode and water is poured into the cavity.

The planting medium used by the propagators varies from one individual to another but the most widely used is a mixture of garden soil, rice hull and coconut coir. Several propagators who use garden soil only as a medium claim that they get similar results as those who use mixtures but they said using rice hull and coconut coir would greatly reduce the weight of their rooted cuttings.

CDC prefers the use of polyethylene bags over propagation plots because once rooted, those planted in the bags can be sold and transported right away but those planted in propagation beds have to be dug, planted in a container and conditioned for a week or two before they can be sold.

Keeping the cuttings moist everyday before rooting takes place is of key importance in growing cuttings. CDC uses a misting system constructed using PVC pipes and nozzles.

As many propagators have observed, there is a great variability in the rooting ability among different species of bamboo when propagated by culm cuttings. There are those that root easily (within a couple of weeks in the case of *Bambusa vulgaris*, *B. philippinensis* and several varieties of *B. multiplex*) and there are those that are very difficult to root such as *Dendrocalamus latiflorus* and *Thyrsostachys siamensis*. Portions of the culm that give high percentages of rooting also vary substantially from one species to another (see Table 2).

Incidentally, to educate some people who repeatedly call rooted bamboo cuttings (culm and branch) as “seedlings”, which is absolutely inappropriate because seedlings are produced from seeds, the author has proposed that the word “cutlings” be used instead.

By Branch Cuttings

Branch cuttings have the same advantage as culm cuttings over the traditional methods of propagation (PCARRD, 2006). Many propagules can be obtained from a single culm.

In Laguna, only CDC uses this method for propagating some species of bamboo. The CDC findings:

1. Some species respond very well to the method but some do not.
2. The method works very well with branches that have “swollen” bases.
3. Branches that have adventitious roots below the branch bases (e.g. *Bambusa blumeana* and *Schizostachyum brachycladum*) are rather easy to propagate.
4. Many species of bamboo form adventitious roots below some of their branches when the culm is cut some distance from the ground.
5. Branch cuttings root faster when the branches have 2 to 3 internodes.
6. The application of a growth hormone (IBA + NAA) induces roots to form earlier in some species, even when the branch has no swollen base. In fact, species like *Bambusa multiplex* forma *variegata* would root easily even if the branch does not include its base if treated with a growth hormone and planted in an enclosed plastic bag.

Marcotting

Marcotting is the term used by some bamboo growers to refer to a method of bamboo propagation in which branch bases are covered with a propagating medium (usually coconut coir) and held in place using transparent plastic sheets tied around the culm with strings or fine wire, PCARRD (2006), Virtucio and Roxas (2003).

The method was tried in the author’s farm on *Dendrocalamus latiflorus* by the instructors of a training course but it did not work well. The author tried it on several other species but it also did not work well. Although the author hasn’t tried it, he believes wounding the culm just below the branch base and applying a growth hormone may lead to better rooting.

Summary and Conclusions

Table 2 summarizes the findings obtained by the author in the survey that he conducted. The table shows the ranges in the percentage of rooting for different bamboos and vegetative propagation methods.

There is a great need to establish more bamboo nurseries in the Philippines, not only to fill the requirements of those involved in landscaping but more so to produce propagules in large quantities for plantation establishment, watershed protection, carbon sequestration, erosion control, riverbank stabilization and the reduction of the incidence of landslides. There is clearly a need to upgrade the knowledge of small-scale propagule producers through training and information materials. Concerned agencies of the government are definitely not doing enough to make sure that their research findings find their way to their intended beneficiaries.

One of the research areas worth looking into concerns the observation made by CDC that the rooting ability of cuttings of some species seems to be affected by the season of the year. For example, *Bambusa philippinensis* cuttings root more easily during summer than in the rainy months. Another area worth looking into is the development of a culm maturity index that is based on easily observed characters so that propagators can be guided accordingly in choosing the culms that they will use for propagation.

In closing, the author is convinced that researchers can learn a lot from private bamboo propagators' experiences. Learning what their practices are could lead them to research problems that are worth investigating.

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Table 1. Findings of the CDC on the propagation of different species of bamboo by cuttings.

Species	Age	# of nodes	Part	Direction
Bambusa bambos	1 - 2	2 - 3	B - M	U, S
B. blumeana	1	1 - 2	B - M	U, S, H
B. dolichomerithalla	1	1	Branchy	U, S
B. merrilliana	1	1 - 2	Branchy	S, H
B. multiplex	1	1	Branchy	U, S
B. multiplex f. variegatum	1	1	Branchy	U
B. oldhamii	1 - 2	1 - 2	Branchy	U, S
B. philippinensis	1 - 2	1 - 2	Branchy	U, S
B. vulgaris	0.5 - 1	1 - 3	Branchy	S, H
B. vulgaris vittata	1 - 2	1 - 3	Branchy	U, S, H
B. vulgaris wamin	1 - 2	1 - 3	Branchy	U, S
Dendrocalamus asper	1 - 2	1 - 3	B - M	H
Gigantochloa levis	1	1 - 3	B - M	H
Schizostachyum brachycladum	1 - 2	1	Branchy	U, S
Schizostachyum lima	1 - 2	2 - 3	Branchy	H

Legend:
B - M: base to middle
U - upright
S - slanting
H - horizontal

Table 2

Ranges in percentage rooting for different species and vegetative methods (based on the experiences of bamboo nursery operators in Laguna, Philippines)

	Scientific Name	Stem cuttings	Branch cuttings	Clump division	Offset	Marcot
1	*Bambusa atra*			>90	>90	
2	*B. bambos*	50-70	50-70			
3	*B. blumeana*	50-70	50-70			
4	*B. dolichomerithalla*	50-70		>90	>90	<5
5	*B. merrilliana*	40-50	50-60			
6	*B. multiplex*	25-40		70-80	70-80	
7	*B. multiplex f. variegata*	60-70	60-70	>90	>90	
8	*B. multiplex var. riviereorum*	<5		>85	>85	<5
9	*B. oldhamii*	50-70				
10	*B. philippinensis*	70-85				
11	*B. sp. (pink bamboo)*	80-100				
12	*B. sp. (Australian bamboo)*	50-70				
13	*B. vulgaris*	70-85	70-85			
14	*B. vulgaris var. vittata*	70-85	70-85			
15	*B. vulgaris var. wamin*	50-70	50-70			
16	*Dendrocalamus asper*	50-70	50-70			
17	*D. latiflorus*	<10				<10
18	*D. strictus*	50-70	50-70			
19	*Gigantochloa atter*	50-70				
20	*Gigantochloa levis*	40-60	50-70			
21	*Guadua angustifolia*		50-60			
22	*Meloccana baccifera*	<10			>90	
23	*Phyllostachys aurea*				>80	
24	*Sasa fortunei*	<10	<10	70-80	70-90	
25	*Schizostachyum brachycladum*	50-60			>90	<5
26	*S. lima*	50-60		>70	>80	
27	*S. lumampao*	50-60			75-90	
28	*Thyrsostachys siamensis*	<5			>90	