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Food and fiber productivity of asper bamboo in Florida, USA

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Abstract

To document the food and fiber productivities of Asper (*Dendrocalamus asper*) bamboo in central and southern Florida, USA, this study systematically installed 31 permanent sample plots in four farms in 2023 and 108 more in another 11 farms in 2024. These plots represented site preparation, planting stock, and cultural practices used from 2018 to 2021. Individual culm basal diameter (BD), DBH, age, and status were measured and recorded for all new plots in June 2023 and May-June 2024. Subsequent monthly revisits during the six-month growing seasons measured the BDs of new food culms. Predictive equations for fiber culm green and dry weights based on BD and DBH, as well as for food culm green weight based on BD, were developed. Plot size and sample size options for individual farm inventories were assessed using culm basal area per hectare, and fiber culm stand and stock tables for farms were constructed using the permanent sample plot data. Food culm yields were similarly derived from monthly inventories. The annual production of food culms with a BD greater than 7.4 cm reached as high as 9,482 kg per hectare in 2024. By estimating future food and fiber production from observed trends, it is projected that within five years, a Florida Asper farm could generate an annual profit, with profits increasing thereafter to approximately $17,000 per hectare by Year 10. The resulting databases will be used for modeling Asper productivity in Florida.

Keywords: Asper, Bamboo, Fiber, Florida, Food, Production, USA.

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Contents

Contribution of this paper to the literature
This study is the first to document the promising food and fiber productivities of Asper bamboo in central and southern Florida, USA, where Asper is being established as a commercial crop.

1. Introduction

Asper bamboo is used for multiple products worldwide [1-7]. Although bamboo is primarily cultivated on a commercial scale in Asian countries, mainly China, it holds significant potential due to its adaptability to tropical and humid regions such as Florida. Additionally, there is a substantial global demand for edible bamboo shoots. Currently, the United States is the largest importer of edible bamboo shoots, accounting for 13% of the global market, which is valued at over $500 million [8]. Additionally, bamboo, a climate-resilient crop, is used for construction materials, paper, and fiber [9]. Thus, growers are expected to tap into the huge financial benefits of this commodity in addition to carbon credit markets [10, 11]. Therefore, not only is bamboo an alternative to other crops, but it is also an economically viable and climate-smart crop [12, 13]. Furthermore, bamboo offers additional environmental benefits, including rapid biomass production, erosion control, and carbon sequestration [14, 15]. Consequently, its potential as an alternative to other crops in Florida, USA, needs documentation.

Approximately 600 hectares of Asper bamboo farms have been established at various locations in central and southern Florida for food and fiber production (Figure 1). In 2022, the Florida Bamboo Growers Association (FBGA) initiated the Key Project to inform members about the profitability of bamboo farming, and a permanent inventory system was installed to monitor the productivity of member farms. The four farms in the 2023 inventory and the 11 new farms added in 2024 (Table 1), a total planting of approximately 63 hectares, are representative of all Asper farms planted from 2018 to 2021 using the following practices: clumps (several approximately 1.3 meters tall culms per clump) were obtained from OnlyMoso USA, which used tissue culture to propagate some initial Asper selections. These were planted and staked at a relatively high density of 988 clumps per hectare from April to October on sandy, well-drained sites in rows covered with plastic and typically irrigated with microjets.

Figure 1. Representative Asper bamboo on an 8-year-old farm near Frostproof, Florida (Left) and a 3-year-old farm near Wauchula, Florida (Right).

Table 1. This table presents data on the year of planting, location in Florida, planting size in hectares, and the number of years each farm has been inventoried for 15 Asper bamboo farms during the 2023 and 2024 inventories.

Farm	Planting year	Location	Planting size	Inventory year
Fatout	2019	Frostproof	1.50	2023, 2024
Hi Hat	2018	Fruitville	6.35	2023, 2024
Merrick	2020	Sebring	10.93	2023, 2024
MFA	2020	Lake Placid	4.05	2023, 2024
Mixon	2017	Bradenton	0.95	2024
Ingram	2020	Lake Wales	8.09	2024
Agri Citrus	2021	Wauchula	3.40	2024
SOS	2021	Wauchula	3.61	2024
Jacksonview	2021	Wauchula	3.40	2024
Bamboo Products	2021	Wauchula	3.08	2024
MacFarm	2021	Frostproof	1.84	2024
Windmill Farm	2021	Frostproof	4.62	2024
Bulow Farm	2021	Frostproof	4.56	2024
Brown	2021	Frostproof	3.01	2024
Faith Farm	2021	Okeechobee	3.73	2024

The Key Project has several objectives: 1) estimate the food and fiber biomass of individual Asper culms; 2) document Asper biomass on individual farms with a goal of ±10% precision and 95% confidence; 3) determine the most efficient plot size and sample size guidelines for repeat and future inventories; 4) document current food and fiber productivity and project future trends; 5) provide a database for modeling Asper productivity.

2. Methods

The FBGA, FFGT, CREC, and OPA collaborated on specific key project fieldwork and analysis as follows.

1. Estimate food and fiber biomass of individual Asper culms

To develop predictive equations for individual fiber culm weight, 26 representative established fiber culms in each basal diameter (BD) and diameter at breast height (DBH) class at Fatout Farm were felled in 2023 and 2024. These culms were measured for height, sectioned into 1.5-meter lengths, and the diameter at the base of each section was recorded. Additionally, 0.15-meter samples were cut at these points. The samples and sections were bagged at the farm and weighed at the CREC. The samples were used to determine green and oven-dry weights, while the sections were weighed initially for green weight and subsequently at 1-month and 2-month intervals during simulated field drying. These data were utilized to develop allometric equations based on BD and DBH for estimating the green and dry weights of established fiber culms.

A similar estimation process was followed for the individual food culm green weight. Thirty-eight food culms with diameters from 7.6 to 14.7 cm (up to 0.5 m tall) were felled at Mixon Farm in 2024, measured for diameter and height, and weighed. The weight was then regressed against diameter and other variables to determine the best prediction equation for estimating food culm green weight.

2. Document Asper bamboo biomass on individual farms.

The FBGA selected four farms to be inventoried in 2023 and an additional eleven farms in 2024 (Table 1). In early June 2023, a total of 31 plots with 6 or 9 clumps each were installed (Table 2). Farm corners were georeferenced (Table 3), as were the systematically allocated plots (Figure 2, Table 4), for easy relocation. The initial group in each plot was permanently marked. In 2024, 108 plots and 11 farms were similarly installed and monumented.

Table 2. Installation dates and sample details for 15 Asper bamboo farms in the 2023 and 2024 Key Project inventories.

Farm	Install Date	n/c=# of plots/# of clumps per plot, Plot Size (ha), Sample Area (ha)					
		2023			2024		
		n/c	Size	Area	n/c	Size	Area
Fatout	6/8/23	3/9	0.00838	0.0251	4/9	0.00838	0.0335
Hi Hat	6/11/23	8/6	0.00595	0.0476	10/6	0.00595	0.0595
Merrick	6/9-10/23	12/6	0.00595	0.0714	16/6	0.00595	0.2352
MFA	6/10/23	8/6	0.00595	0.0476	10/6	0.00595	0.0595
Mixon	5/24/24				1/6, 2/9	0.00357, 0.00536	0.0143
Ingram	5/30/24				10/6	0.00595	0.0595
Agri Citrus	6/08/24				6/6	0.00595	0.0357
SOS	6/08/24				6/6	0.00595	0.0357
Jacksonview	6/11/24				6/6	0.00595	0.0357
Bamboo Products	6/10/24				6/6	0.00595	0.0357
MacFarm	5/22/24				8/6	0.00595	0.0476
Windmill Farm	6/06/24				6/6	0.00595	0.0357
Bulow Farm	6/06/24				6/6	0.00595	0.0357
Brown	6/07/24				4/6	0.00595	0.0238
Faith Farm	4/01/24				7/9	0.01113	0.0779

Figure 2. Representative map of farm corners and permanent plots: NW, NE, SE, and SW corners of the 5-year-old MFA farm and the eastern edges of its eight 0.00595 ha rectangular (6 rows x 1 clump) inventory plots, assigned by a systematic grid.

Table 3. GPS coordinates of the northeast (NE), southeast (SE), northwest (NW), and southwest (SW) corners of the MFA farm in the 2023 inventory.

Corner	Latitude (°N)	Longitude (°W)
MFA – Brown Rd, Lake Placid, FL - 10 Acres – September 2020		
NE	27.309	81.361
SE	27.307	81.361
NW	27.309	81.363
SW	27.307	81.363

Table 4. Directions to and GPS coordinates of eight permanent plots on the MFA farm.

Plot	Directions	Latitude (°N)	Longitude (°W)
MFA Farm – E edge of plot consisting of 6 E-W clumps (24.4m x 2.44m=0.00595ha)			
MF1	40.2m S from NE corner of 2nd 6-row N-S strip from E	27.309	81.361
MF2	40.2m S from E edge of **MF1**	27.309	81.361
MF3	40.2m S from E edge of **MF2**	27.308	81.361
MF4	40.2m S from E edge of **MF3**	27.308	81.361
MF5	40.2m S from NE corner of 5th 6-row N-S strip from E	27.309	81.362
MF6	40.2m S from E edge of **MF5**	27.309	81.362
MF7	40.2m S from E edge of **MF6**	27.308	81.362
MF8	40.2m S from E edge of **MF7**	27.308	81.362

Before the start of the growing season, established fiber culms in each clump were permanently labeled with duct tape and numbered sequentially, proceeding clockwise from due north. In 2023, to establish a relationship between basal diameter (BD) at the groundline and diameter at breast height (DBH) at 1.37 meters above ground, the BDs and DBHs of the first five fiber culms in each clump were measured to 0.1 cm (see Figure 3). The BDs and DBHs of subsequent established culms were tallied by BD class. Culm age was also recorded. BDs of new, presumably food, culms were tallied one month after the start of the growing season, and monthly revisits throughout the six-month growing season also labeled and tallied new food culms by BD and harvest status. At the beginning of the next growing season, culm status was noted to account for mortality, among other factors.

Figure 3. Representative DBH (Left) and BD (Right) measurement of Asper bamboo in permanent inventory plots.

From the plot culm tallies, culms per hectare (CPH), basal area per hectare (BAH, representing the culms' accumulated cross-sectional area based on BD), and several biomass quantities were calculated for existing culms. These include green tons per hectare (GTPH), determined using appropriate allometric equations. Food culm tabulations categorized by BD classes listed monthly numbers and weights per hectare, as well as total figures, for each farm and overall.

3. Determine most efficient plot size and sample size

Based on BAH data from four farms in 2023, the plot sizes and the number of plots per farm needed to achieve inventories with a ±10% precision and 95% confidence level were calculated. These calculations ensure that reinventory and future inventories of other farms produce statistically reliable production values. Four sources of variation that could influence inventory design were examined through analysis of variance (ANOVA) using a nested design: culms within clumps, clumps within plots, plots within farms, and differences among farms.

4. Document current food and fiber productivity and project future trends

Key project data were used to assess the influence of farm and age differences on food and fiber production, as well as different food culm merchantability standards. Due to these changing standards, food productivity estimates at minimum basal diameters (BDs) of >6.1 cm and >7.4 cm were compared. For projections, 70% of new culms were assumed to be harvested for food starting at 4 years, with 30% remaining for later harvesting as fiber culms. Many 10-year projections of individual farm productivity utilized underlying trends in production increases from other farms. Food culms were valued at the current rate of $2.205 per kg, with harvesting costs at $0.551 per kg, and fiber culm value and harvesting were also assumed. Greenfield Bamboo's average farm management cost of $4,942 per hectare was applied. Net annual income was calculated for the first 10 years of Asper's expected 50+ year lifespan.

5. Provide a database for modelling Asper productivity

Key project data from the food and fiber culm samples and from the permanent plots installed on the 15 farms in the 2023 and 2024 inventories were maintained and reviewed for possible modeling options.

3. Results and Discussion

A wide range of results was made possible by the Key Project's activities, starting with individual culm weight estimates that were then combined with tallies of culms in plots on individual farms to calculate their food and fiber production with known accuracy and precision. Across farms and over time, assessments elucidated important trends, as current and ongoing efforts have the potential to further the development of Asper farming in Florida. Following are examples of these types of results.

1. Estimate food and fiber biomass of individual Asper culms

Regression equations were generated to predict food and fiber culm weights. As indicated by r^2, BD, BD^2, and the interaction of BD^2 with culm length (L) and height (H), these variables progressively improved the accuracy of culm weight predictions (Table 5). Since L and H are not typically measured during inventories, the BD^2 equations were employed to estimate culm weights, as demonstrated for fiber culms in Table 6.

Table 5. Regression equations for Asper bamboo food and fiber culm green weights in Florida: Biomass predicted using diameter (BD, cm) alone or in combination with food culm length (L, m) or fiber culm height (H, m). The table includes sample size (n), coefficients of determination (r^2), and the respective equations.

Biomass	Equation	n	r^2
Food Culm Green Weight	-1.3553 + 0.6392 x BD	38	0.669
Food Culm Green Weight	0.2516 + 0.0131 x BD^2	38	0.705
Food Culm Green Weight	0.2972 + 0.0262 x BD^2 x L	38	0.806
Fiber Culm Green Weight	-10.4258 + 7.3118 x BD	26	0.811
Fiber Culm Green Weight	-0.3194 + 0.2424 x BD^2	26	0.815
Fiber Culm Green Weight	1.5862 + 0.0217 x BD^2 x H	26	0.893

Table 6. Predicted harvest green weights (GW_0, kg) for Asper bamboo fiber culms in Florida with BDs from 2.54cm to 15.24cm.

Fiber Culm GW_0 (kg) = -0.3194 + 0.2424 BD^2	
BD	**GW_0**
2.54	1.247
5.08	5.937
7.62	13.753
10.16	24.698
12.70	38.778
15.24	55.978

2. Document Asper bamboo biomass on individual farms

Culm BD and DBH were strongly related in the 26 culm fiber samples. Due to this relationship ($r^2 = 0.96$) and the fact that all culms were measured for BD, all analyses were based on BD, although measuring culm DBH would be easier if fiber were the sole product.

At the individual farm level, key project data presented in stand and stock tables that tabulate the number of culms, BAH, and weights by BD classes can describe market potential. For example, commercial fiber production depends on culm size and number, as demonstrated by the stand and stock table for the MFA Farm in Table 7. This young farm, while having a large number of culms per hectare, had relatively few merchantable-sized culms (BD > 7.4 cm) per hectare or in total in 2023.

Table 7. Representative farm stand and stock table for fiber culms: number of culms per hectare, BAH, and metric tons per hectare, as well as total culms and tons, including average BD and number of culms per clump for the 4.05-hectare, 3-year-old MFA farm.

Culm BD (cm)	**Per Ha**			**Total**	
	Culms	**BAH (m^2/ha)**	**Tons**	**Culms**	**Tons**
2.54	8,829	4.48	8.07	35,733	32.6
5.08	6,160	12.51	39.01	24,928	157.9
7.62	378	1.72	3.81	1,531	15.4
10.16	22	0.16	0.22	85	0.9
Total	**15,390**	**18.85**	**51.33**	**62,277**	**207.7**
Ave BD = 3.81cm	**Culms/Clump = 16.9**				

Key project data can also document farms' Asper food culm production, which is dynamic during a growing season and restricted to new culms no taller than 0.5m. Hence, monthly inventories can determine the amount of food production possible with biweekly harvests. As shown in Figure 4, these amounts varied by month and farm in 2024, primarily due to farm age but also influenced by management practices and weather conditions.

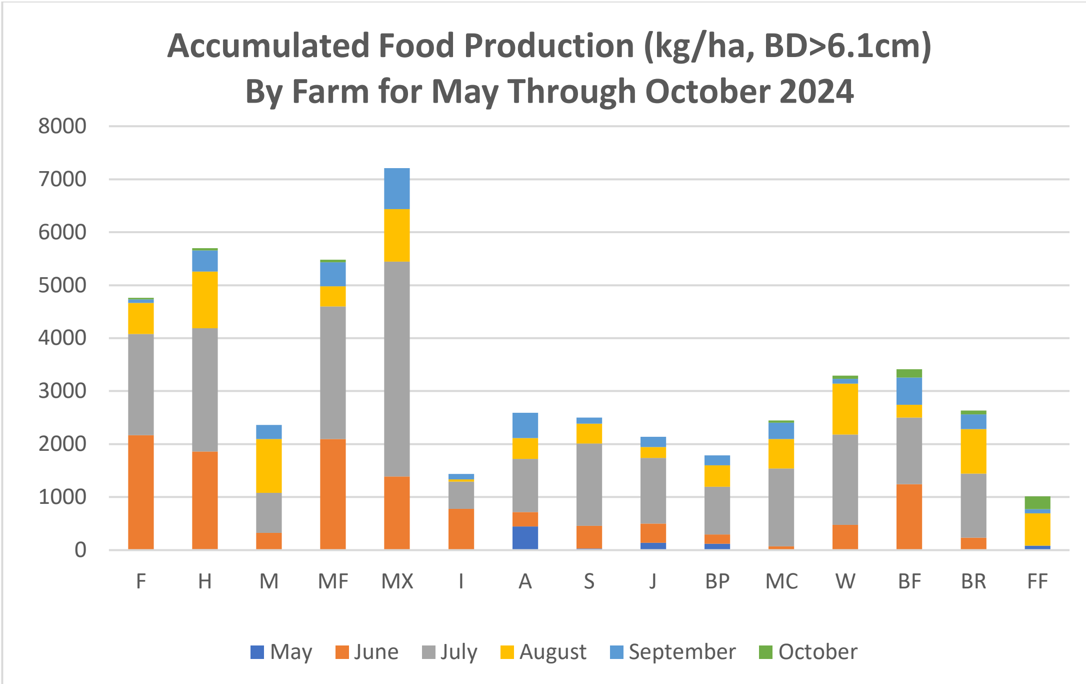

Figure 4. Asper food culm production by month and overall during the 2024 growing season for the 15 farms listed in Table 1.

3. Determine the most efficient plot size and sample size.

Based on BAH data from the four farms inventoried in 2023, various statistics and the number of plots per farm needed to achieve inventories with ±10% precision and 95% confidence ranged considerably (Table 8). BAH variability among clumps within plots was over 100% in some Fatout Farm plots and as low as 22% in some MFA Farm plots, indicating that culms within the Fatout plots varied much more in BD than the culms in the MFA plots. BAH variability was much less at the among-plot level, with a low coefficient of variation (CV) of 13% in the relatively uniform MFA Farm, resulting in only nine plots being needed to meet the statistical goals.

Table 8. Representative inventory statistics from four older farms include data on area, number of plots (n), total culms and clumps in the sample, coefficient of variation (CV) among clump BAHs within plots and among plots, sampling intensity, achieved precision, and the number of plots required to attain 10% precision with 95% confidence for each farm.

	Farm			
Value	**Fatout**	**Merrick**	**MFA**	**Hi Hat**
Area (ha)	1.50	10.93	4.05	6.35
n	3	12	8	8
Total Culms	430	1,322	941	901
Total Clumps	27	72	48	48
CV Clumps/Plots (%)	94-108	30-147	22-71	37-79
CV Plots (%)	16	23	13	18
Sampling intensity (%)	2.1	0.7	1.2	1.1
Achieved precision (±%)	38	38	11	15
Plots for 10% Precision	49	68	9	18

Variation among clumps within plots for BAH was significant for all four 2023 farms, especially for the Merrick Farm (Table 9). Across the farms, plots within farms were not significant (Table 10).

Table 9. Representative significance of variation (** at the 5% level) for an individual farm: Merrick.

Source	df	Mean square	F
Plots	11	3.711	1.54
Clumps (Plots)	56	2.413	6.30**
Culms (Clumps (Plots))	955	.3829	

Table 10. Across farms (ANOVA) for the four 2023 farms.

Source	df	Mean square	F
Farms	3	4.098	1.62
Plots (Farm)	27	2.523	1.25
Clumps (Plots (Farms))	154	2.018	
Culms (Clumps (Plots (Farms)))	2891		

Based on these findings, the number of plots was increased in these farms in 2024 (Table 2). The number of plots installed in the 11 farms in 2024 reflected a relatively high perceived degree of uniformity within each farm.

4. Document current food and fiber productivity and project future trends.

While Asper has many uses [1, 3, 5-7], food and fiber markets are the most likely in the near-term in Florida. Thus, food and fiber production prospects are of immediate interest.

One important key project finding was farm production by farm age, so that farm productivity could be modeled over time. With age, the number of new culms produced increased (Figure 5), especially in 2024. BD of the new culms was also larger than in the previous year.

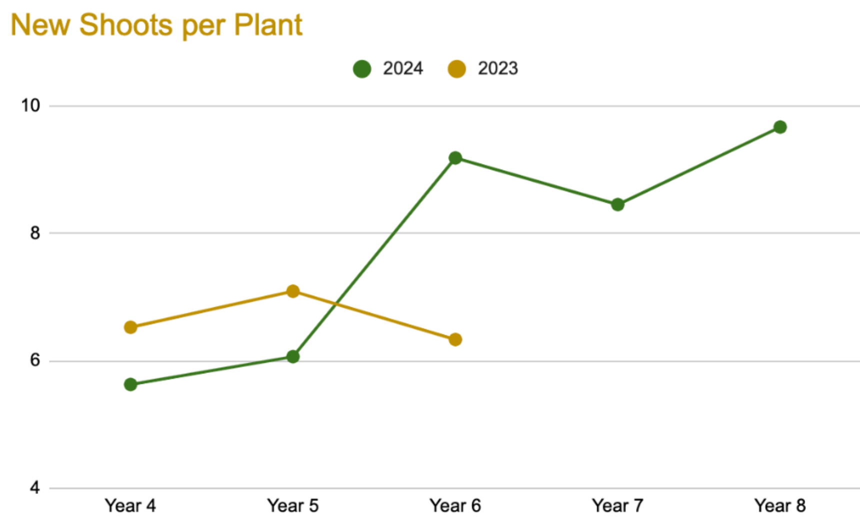

Figure 5. Number of new culms per clump by farm age (years 4 to 8) and year of observation.

Key project food culm data assessed the influence of farm and age differences, as well as different merchantability standards (Table 11). For four older farms, overall food productivity in 2024 was 3.2 times higher than in the previous year, when the minimum BD was greater than 6.1 cm. In 2024, 1.3 times more food was produced when the minimum BD was greater than 6.1 cm instead of greater than 7.4 cm.

Table 11. Food culms per hectare (CPH) and their average basal diameter (BD in cm) of four older farms, analyzed based on age (years 2023 and 2024). The table also presents the proportion of culms (%) and productivity per hectare (FPH in kg/ha), considering the influence of two minimum merchantable basal diameters.

	2023:		BD>6.1cm		2024:		BD>7.4cm		BD>6.1cm	
Farm	**CPH**	**BD**	**%**	**FPH**	**CPH**	**BD**	**%**	**FPH**	**%**	**FPH**
Fatout	5,701	6.1	34	4,279	5,889	7.4	45	7,328	67	9,527
Hi Hat	5,847	5.8	32	4,062	7,482	7.1	44	9,068	62	11,392
Merrick	5,733	4.6	9	906	4,846	5.8	22	2,762	41	4,721
MFA	5,463	5.3	18	2,262	5,360	8.1	52	9,482	58	10,960

For younger farms, the impact of a lower merchantable BD for food culms was greater (Table 12). The yield of 4-year-old farms was estimated to be 57% higher, decreasing to 21% for 5-year-old farms, and even less for older farms. Asper fiber yields are also projected to increase as current farms age (Table 13).

Table 12. Harvestable food culm weights (kg/ha) by farm age: Total, BD>7.4cm, BD>6.1cm, and % change due to decreasing minimum BD from >7.4 to >6.1cm.

Year	Total	BD>7.4cm	BD>6.1cm	% Change
4	4,236	1,603	2,511	57
5	6,014	3,968	4,788	21
6	7,457	5,199	6,177	19
7	9,247	6,810	7,968	17
8	11,466	8,922	10,278	15
9	14,218	11,687	13,260	13
10	17,489	15,311	17,104	12

Table 13. Predicted harvestable fiber culm yields (mt/ha) by farm age and year.

	Year				
Farm Age	**2025**	**2026**	**2027**	**2028**	**2029**
4	323	939	937	157	188
5	130	827	2,405	2,394	401
6	229	155	993	2,885	2,874
7	139	276	186	1,193	3,463
8		168	330	222	1,430
9			202	397	267
10				240	475
11					289
Total	820	2,365	5,051	7,490	9,388

A farm management plan for harvesting 70% of new culms for food and retaining 30% for later fiber harvest was developed (Table 14). Food harvesting occurred twice per week for new culms exceeding 6.1 cm throughout the growing season from June to October, starting in Year 4 and continuing through Year 10. This typical farm generated a profit in Year 5, which increased in subsequent years, reaching over $17,000 per hectare in Year 10. The average profit over the 10-year period was approximately $3,436 per hectare. Such income levels may be sustained for more than 50 years.

Table 14. Predicted per ha harvested food culm weight (kg), food income ($), food harvest cost ($), fiber income ($), management cost ($), and net income ($).

Year	Food weight	Food income	Food harvesting	Fiber income	Management	Net income
1	0	0	0	0	4.942	-4.942
2	0	0	0	0	4.942	-4.942
3	0	0	0	0	4.942	-4.942
4	4.236	1.812	1.119	0	4.942	-1.584
5	6.014	3.210	1.982	0	4.942	1.006
6	7.457	4.119	2.545	494	4.942	3.185
7	9.247	5.286	1.321	1.236	4.942	6.089
8	11.466	6.872	1.696	1.730	4.942	9.358
9	14.218	8.701	2.175	1.977	4.942	13.161
10	17.489	11.162	2.781	2.224	4.942	17.969

The productivity observed in these inventories compares favorably with Asper's growth elsewhere. In Ethiopia, Asper was more productive than five other species [16]. First-year culms were the shortest, and culms emerging in subsequent years were progressively taller. At three years, Asper's annual culm recruitment was 3.1 culms per clump, with a height of 8.0 meters, a diameter at breast height (DBH) of 4.7 centimeters, and an above-ground green weight of 32 kilograms per clump. Asper also exhibited significantly thicker culms. In a planted bamboo study conducted in Malaysia using permanent sample plots, three sources of Asper were evaluated for early growth. The three-year-old *Dendrocalamus asper* (Green) had the highest culm diameter, measuring 3.61 centimeters [17]. Across five areas of the Philippines, environmental factors affected a number of Asper characteristics [18]. Also in the Philippines, three-year-old Asper culms were more than 6cm in diameter [19]. Asper growth was similar across different soil types in Indonesia [20].

Current Florida Asper bamboo farms are productive, the quality of newer farms is improving, and management research akin to that done elsewhere [21-25] is underway [26]. While current Asper markets are food (bamboo shoots have high nutritive values and health benefits [6, 27]) and fiber, Asper culms may also be used to manufacture particleboards and other fiber products [1, 3, 28-30], but the top half of a fiber culm is stronger than the bottom half [7]. Bamboo is also a potential source of bioactive compounds and natural antioxidants [5, 31], and it can be effective for phytoremediation [32-34]. For commercial food and fiber use in Florida, however, the biggest issue is obtaining a reasonable portion of the production harvested economically, which will require collaboration with harvesters.

5. Provide a database for modelling Asper productivity

Data from the food and fiber culm samples and from over 16,000 culms in 136 permanent plots installed on 15 farms in the 2023 and 2024 inventories, which will be augmented annually with monthly revisits during future growing seasons and with new farms, e.g., in 2025 from 88 plots in an additional 11 farms, will be used to model Asper productivity. Dependent variables may include the green weight of food culms, while fiber culm weights could be measured as green at 0, 1, or 2 months after harvest or dry, depending on market requirements. Independent variables are likely to include farm age, BAH, and BD of new food culms. When combined with the costs of farm establishment, management, harvesting, processing, and market values, such models will be invaluable for the Asper bamboo industry in Florida.

4. Conclusions

Predictive equations using BD^2 for food green weight and/or DBH^2 for fiber green or dry weight suffice, although adding culm height improves the fit. Because fiber culms take several years to mature, repeated observations from permanent plots are necessary to determine what proportion of fiber culms will be harvestable. The size and number of food culms also change over time. Recording the GPS coordinates of permanent plots facilitates plot revisits. Depending on clump variability in basal area (BA), six clumps per plot may not be enough; an average clump coefficient of variation (CV) of less than 40% is ideal. While systematically distributing permanent plots avoids bias, having enough plots to achieve a plot CV for BA of 15% or less increases confidence in inventory results. Important changes in stand composition related to merchantability are evident in stand and stock tables generated annually. A 10-year management plan suggests that an Asper farm could generate a profit in Year 5, with profits rising to approximately $17,000 per hectare in Year 10. Developing growth models based on variables such as age, BA, and new culm diameter, combined with economic factors, can guide management decisions to maximize Asper profitability in Florida.

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