



## **Growing Inclusive Markets**

Business Works for Development • Development Works for Business

CASE STUDY

Asia • Philippines

### **Coco Technologies: Providing Livelihood Opportunities for Poor Coconut Farmers through Value-Adding**

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Sector • Agriculture  
Enterprise Class • Local SME



## Summary

Coco Technologies (CocoTech) is a privately-held enterprise in the Philippines that produces geo-textiles from waste coconut husks. It pioneered the application of bioengineering using cocofiber nets (coconets) in slope protection, river and shoreline rehabilitation and erosion control in the Philippines and other countries in Asia and Europe. CocoTech grew from a small community-based project with an initial capitalization of about US\$7,000<sup>1</sup> and five employees in 1993 into a medium-sized enterprise<sup>2</sup> of 25 employees with revenues exceeding \$300,000 in 2006 and more than 6,000 families involved in the manufacture of CocoTech products. This case examines the special challenges and opportunities of small-scale value-adding and the innovative approaches adopted to ensure the sustainability of a nascent technology that provides rural employment, protects the environment and helped revive an ailing coconut industry.

## Coconut farmers Among the Poorest of the Poor

In the early 1990's, Dr. Justino Arboleda (known in the Philippines simply as Bo), an agricultural engineer and scientist, was elected Dean of the College of Agriculture at Bicol University.<sup>3</sup> After returning from his doctoral studies in Japan, he had immediately noticed the worsening plight of the Filipino farmers and decided to undertake research on coconut farming for three reasons:

- Coconut farmers are disproportionately poor. There are 3.5 million coconut farmers (less than four percent of the country's estimated 89 million people) who comprise 20 percent of the country's poor.
- The Philippines is the world's second largest producer of coconuts<sup>4</sup> (next to Indonesia), with 67 percent of the country's farmlands planted to coconuts.
- Coconut farming is the major industry of Bo's native region, Bicol.

Reflecting on these facts, Bo made it his personal mission during his tenure in the University to find out why, in spite of the abundance of coconuts, the coconut farmers are mired in poverty and to find out what the agricultural academic community has done to address this problem. He learned that the Government's research and development activities were focused mainly on rice and corn, which is why the country's agricultural colleges and universities—the majority of which are state-owned—pattern their curriculum to cater to this focus; as a result, very little attention was given to other agricultural products, particularly coconuts.

The lack of coconut farming technological know-how was exacerbated by serious flooding and landslides during the typhoon season (from June to November), which destroys farmland

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<sup>1</sup> All figures quoted are in US dollars

<sup>2</sup> The Philippine Department of Trade and Industry defines small- and medium-size enterprise (SME) as those with a capitalization of not more than US\$2 million and a workforce of 100 or less.

<sup>3</sup> Bicol is one of the poorest regions in the Philippines and one of the country's major coconut-producing regions, situated approximately 449 kilometers southeast of Manila.

<sup>4</sup> Source: Nation Master Statistics. [www.nationmaster.com](http://www.nationmaster.com)



and crops. Because of the mountainous topography in the Philippines, soil erosion is a major problem. Half of the land area is considered upland or slopes of more than 18 degrees, with weather patterns characterized by strong tropical typhoons. Illegal and rampant logging operations also contribute to increasing land degradation and denudation of forests.

As an agriculturist, Bo knew that farming and the environment go hand in hand in addressing the farmers' economic problems. Thus, the stage was set for his quest to find solutions.

## **Saving the Ailing Coconut Industry**

In the Philippines, the coconut tree is called the “*tree of life*” because of its wide-ranging uses. Nevertheless, the traditional focus on just *copra* (dried coconut flesh) and oil makes farmers vulnerable to market fluctuations, and the coconut industry has been struggling to remain viable. Desperate for income, some farmers cut down their coconut trees to sell as lumber, leading to severe depletion of productive trees. Expanding the product line was viewed by leaders of the country's coconut industry as a means for bettering coconut farmers' economic conditions. In recent years, demand for virgin coconut oil and coconut biodiesel in both domestic and international markets has re-invigorated the industry.

The Philippines produces six billion kilos of coconut husks per year (about 732,750 metric tons of cocofibre per year), constituting the largest single source of country's agricultural waste and a major source of greenhouse gas emissions.<sup>5</sup> The husks are normally thrown away or burned— in the process, harmful particulates and noxious gases are released into the atmosphere. Out of this waste, Bo saw a huge potential; he just needed to find a way to add value to waste coconut husks.

Bo proposed to conduct a study on the productive uses of the coconut husks to Bicol University. Unfortunately, the University did not have the funds to support such a study, so he took it to the International Research and Development Center (IRDC), the principal research and development arm of the Government, who after several months finally agreed.

The study involved a series of experimentation conducted by his students. The first task was to design a machine called a decorticator, which grinds waste coconut husks, producing fibre and peat- in the process discovering that a coconut husk is 35 percent fibre and 65 percent dust or peat. Then, by using a 100-year-old weaving process, they learned that cocofiber could be made into twines or ropes and woven into nets. They also discovered unique characteristics of coconut fibre:

- Coconut fibre is completely biodegradable
- It degrades naturally at a rate that allows vegetation to settle firmly in the soil; in contrast, other geotextiles degrade faster than plants can grow
- The fibre has excellent water-absorption and water-holding capability, which helps to prevent water from going directly into the soil— a major cause of soil erosion

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<sup>5</sup> Source: Philippine Coconut Authority

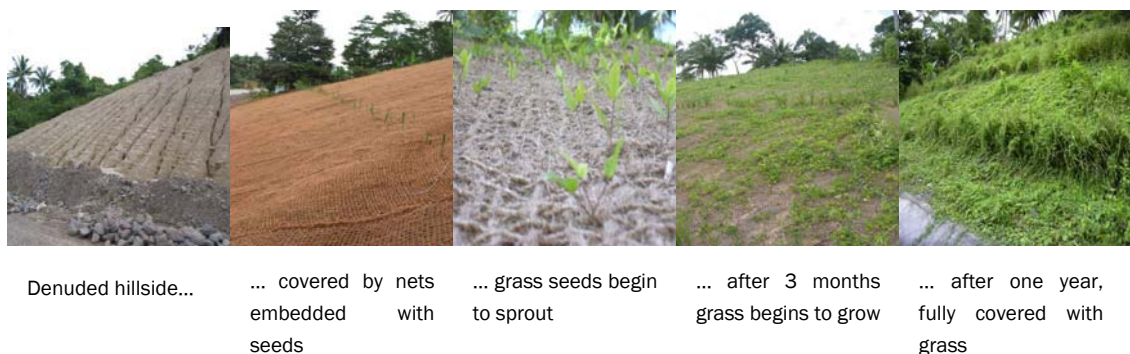


- It has natural rooting hormones

Finally, they successfully tested the effectiveness of the nets for soil erosion control.

Consultations with local public works officials confirmed that the cocofiber nets were much cheaper than imported synthetic materials that were commonly used in public works and construction. Experimentation at local farms using coconut peat as soil enhancer also proved highly successful. Bo encouraged local groups of farmers and cooperatives to go into cocofiber-making by offering training courses, emphasizing the potential for an alternative income stream. He introduced the cocofiber nets to the Philippine government units as an effective technology to solve serious erosion problems, particularly in government infrastructure projects, such as roads and bridges. He pointed out the potential for savings—especially to the country’s foreign exchange reserve— by eliminating the need to import pricier synthetic materials. Finally, he stressed that the government’s adoption of cocofiber nets for erosion control would create a stable domestic market, and therefore help rejuvenate the coconut industry.

**Figure 1: Demonstration of cocofiber nets’ impact on controlling soil erosion**



## Braving the Challenges

After his capacity building and advocacy efforts, Bo attempted to turn the project over to the farming cooperatives, who were not enthusiastic because of the lack of government support in providing initial capital and assistance in identifying markets. In addition, potential investors approached by Bo were wary of putting money into a new technology that was as yet unproven and largely unknown in the local market.

This failure to enlist support was a reality check for Bo. He decided to leave the University to start a business— CocoTech— with the objective of helping poor coconut farmers and the environment through the production and application of cocofiber nets.

## The Beginnings of CocoTech

Bo was able to convince the University to lend CocoTech the decorticator that he and his students had designed. He also sought financing from local banks for the nascent cocofiber



net business, but every bank he approached turned him down. Bo was relentless. In the end he had to use his family's life savings to fund the project. *"My wife was so scared to put all we had into the project as she herself wasn't sure if the project would work, but I guess she trusted me enough,"* Bo confessed. His wife Julie added, *"Actually, a part of it came from my retirement, but deep inside, I knew that sharing what we have is my way of supporting Bo's dream to help the poor. Looking back, it was all worth it."* With the help of some relatives, Bo was able to pool about \$7,000 to start what was then called Juboken<sup>6</sup> Enterprise.

Based on feasibility studies, the viability of CocoTech's operations depended on the proximity of the raw materials to processing facilities- that is, within a radius of 50 kilometres. It was thus logical to focus the business activity in Bicol. This was helpful for Bo's fundraising efforts since Bicol was his native region, and he had a strong existing network of relatives and friends. By the time he started his operations- employing a handful of staff and convincing ten families to engage in cocofiber twine-making and weaving- he had raised an additional US\$2,000 without collateral in several small loans from contacts at various rural banks.

## **Embedding the Community in CocoTech's Business Operation**

Motivated by his desire to address obvious social and economic divides among the coconut farming communities, Bo Arboleda designed a business model that involved the community in every step of the process- a task made easy, because the production of coconets and other cocofiber products is labour-intensive.

The production of coconets as well as other cocofiber products involves five major processes. The steps and income generated for workers in each step is as follows (see Appendix A for an illustration of the cocofiber process):

1. Purchase husks from coconut farmers for US\$0.03 per husk.
2. Process husks into fibre and peat using the decorticator (decorticator operators earn US\$3 to \$5 per day).
3. Pack and distribute fibre to the community (workers [packing and loading] and drivers earn an average of US\$3 per day, and the company provides a transport vehicle).
4. Twine fibre: twining is often done collectively by families (they earn US\$5 per day or about \$100 per month<sup>7</sup>, a significant increase for coconut farmers who typically earn up to \$30 per month).
5. Weave twine into nets (there are two weavers per loom; each receives US\$2 per day).

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<sup>6</sup> Juboken is the former name of Coco Technologies Corporation. Juboken is the combination of the names of Bo, his wife Julie and their son Ken. Even today, Juboken is still the most recognizable name of the company. In fact, CocoTech's main production facility in Bicol still carries the name of Juboken.

<sup>7</sup> This is on the assumption that a family works only 20 days a month. But in reality most families work every day except Sundays.



CocoTech’s product processing is typically carried out by the under-employed members of the coconut farming communities such as women and out-of-school young men. Generally, an entire family gets involved in twining, usually led by women and a handful of otherwise unemployable males (for example, the physically handicapped). If a family employs four members, their income is four times greater. Families pay for the fabrication of the twining equipment, which cost about US\$30 to \$40 per “twiner.” This is considered to be their contribution to the project.

Weaving is done exclusively by women– in part out of tradition and in part because of the stigma attached to weaving as female only activity– and men are primarily involved in plant operations. This involves heavier and more intense work such as operating and maintaining the decorticating equipment, and sorting fibre for distribution to various households. The operations workers put in 5am to 5pm days each week. Women who work from home are more flexible with their time.

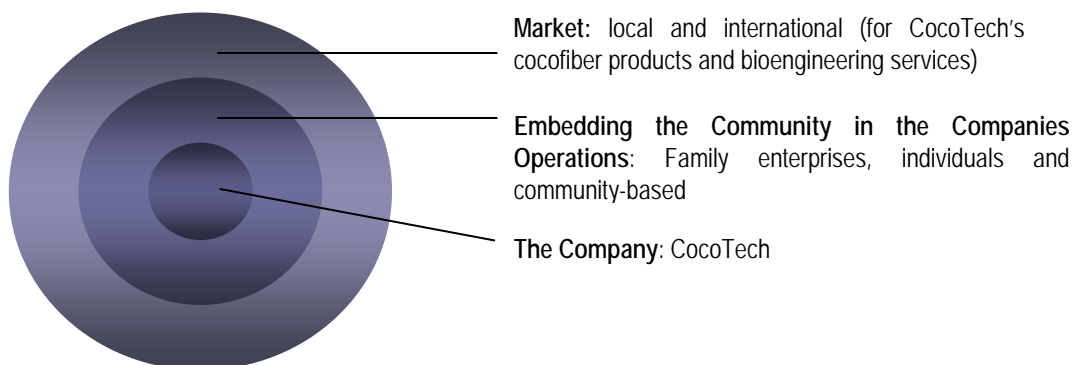


CocoTech invested heavily in the capacity-building of individuals, families and local enterprises to ensure a robust and dynamic supply chain. The company considered the community as its primary business partners. By 2006, more than 8,000 families were involved in the Philippine coconut fibre industry.

Over the past thirteen years, CocoTech has validated a novel supply chain that includes the direct involvement of the coconut farmers, eliminating the middlemen.

The figure below illustrates the critical sphere of CocoTech’s business partners, which are the key elements of its business model.

**Figure 2: CocoTech’s Business Model**





## Sharing Operational Accountability with the Community

CocoTech organized the community partners with the help of local government units. Together they provided training in business affairs, such as ensuring the quality of the products, timely delivery of cocofibre for twining and transporting the twine from one community or household to another for weaving. In essence, the community partners represent the assembly line of the CocoTech's operations. Sharing the accountability of the company's operations with the local farmer organizations has helped create a sense of ownership on the part of the community and efficiency on the part of the company.

## Replicating a Community-Based Approach to Production

The success of the community-business partnership approach of Juboken prompted Bo to replicate the model in other parts of the country. CocoTech's primary strategy for replication and scaling up was to partner with various community-based organizations (such as NGOs, small and medium sized enterprises and people's organizations) located in coconut producing provinces where CocoTech's projects are located. In some cases the cost and convenience of shipping goods from the suppliers to Manila are also a consideration in its choice of partners. An example is the replication of the SRE model in the province of Sulu in the Autonomous Region in Muslim Mindanao (see Box 1) who has access to two cargo ships that supply the Sulu-to-Manila route.

The company's partners are autonomous and self-reliant enterprises. CocoTech encourages each one of them to develop its own markets, wherever possible. CocoTech does, however, provide technical assistance in designing and fabricating machinery and equipment. In some cases, CocoTech loans or donates machinery and equipment, and provides hands-on training in bioengineering. Today, there are at least nine "CocoTech-like" enterprises around the country (see Appendix B for partner locations). They serve as consolidators of coconet production activities in their respective provinces and sell the coconets to CocoTech.

### Box 1: The Multiplier Effect of CocoTech: The SRE Experience

*"Kung hindi lang sa project na ito, siguro ngayon ay lima na ang anak ko!" ("If it were not for this project, I am sure that by now I would already have five children!"), Flora Navaresa, one of the women workers who produce cocofiber nets at the cocofibre processing facility of Sustainable Rural Enterprise (SRE), told a visiting journalist.*

In 2001, SRE, a community based organization based in Aklan Province, visited CocoTech's facility in Albay. Having learned about CocoTech's operations, SRE figured that acquiring the coconut fibre processing technology of CocoTech was an ideal method of disposing thousands of waste coconut



husks that SRE's partner, the Ibayay Small Coconut Farmers Development Cooperative (ISCFDC), had accumulated at its mini-oil mill facility in Ibayay, Aklan.

Two staff members of SRE made a follow-up visit to learn about the processes, including the design of equipment such as the decorticator, sieving drum, twiner and loom. A series of training sessions followed, covering skills in twining, weaving, operating and maintaining machinery and equipment and quality control. It was also during this period of training that the SRE women discovered that they could double production by modifying and improving the original twiner and loom that had been brought in from CocoTech—improvements that were, in turn, replicated by CocoTech.

In 2003 SRE delivered its first batch of nets to CocoTech, produced by 75 families. A grant in 2004 from the World Bank Development Marketplace allowed SRE to expand its operations by purchasing a larger-capacity decorticator and training more families in other communities (including families of former Nationalist People's Army communist insurgents). With guidance from CocoTech, SRE staff members acquired skills in cocofiber processing and were able to carry out its own demonstration installations at local mangroves and fishponds. In addition, SRE expanded its product line by processing coconut dust into cocopeat, with help from CocoTech, Sagana 100 (the country's leading producer of organic fertilizer) and the Philippine Coconut Authority. In 2005, SRE's "Aklan Model" was successfully replicated in the Autonomous Region in Muslim Mindanao in Indanan, Sulu— in collaboration with the Philippine Business for Social Progress/Center for Corporate Citizenship and the German Development Service. The first phase of the Sulu project is expected to benefit more than 250 families of poor coconut farmers and former Muslim rebels by the end of 2006. SRE is also a leading advocate for the increased use of cocofiber products in the Philippines.

Currently SRE sells all of its production to CocoTech. SRE has a workforce of more than 400 families, and the majority of workers are women. This newfound "women power" has allowed its partner, the ISCFDC, to increase its membership by three-fold and to elect its first-ever woman chairperson. Women workers are now eligible to take out small loans from lending institutions and local shops and stores. SRE is gaining a reputation as Western Visayas Region's leading producer of quality cocofiber products.

Installations of the coconets in nearby Antique Province have become tourist attractions. This particular project was credited with minimizing the effects of the typhoon Milenyo, which caused flooding and landslides in other unprotected areas of the province. The Governor of Antique expressed her gratitude and hoped that many more vulnerable areas will have similar coconet installations.

For all of these achievements, SRE gives credit to CocoTech.



## **Expanding the Market to Provide More Work for the Communities**

Bo's first few clients were local government units and domestic companies involved in land development and landscaping activities. Aside from the production of cocofiber net geotextiles, CocoTech also provided the following technical services to customers: project feasibility study, bioengineering system design, installation services and supply of bioengineering materials (cocofiber nets). This was moderately successful, but CocoTech aimed to stimulate employment for the families of coconut farmers, and the only way to do this was to expand the market.

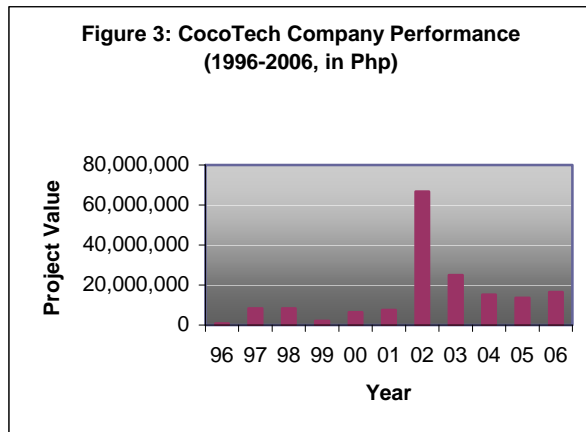
An opportunity arose when Bo was invited by the German Development Service to participate in a conference in Munich, Germany where he met the officers of Bestmann Bioengineering Company. The company was looking for a natural alternative for jute and plastic fibres which Bestmann was using at the time to make mattresses and upholstery for car seats for clients such as Mercedes Benz. Bo convinced the company to try cocofiber.

Bo came back to the Philippines with a job order from Bestmann, the latter having discovered that cocofiber was indeed superior, particularly for its water-absorption capacity and natural biodegradability. The company asked CocoTech to help carry out a larger-scale experiment on the use of cocofiber for erosion control in Europe. They were particularly interested in using a natural fibre. This partnership introduced CocoTech to the international market. It opened new opportunities for the company not only in providing cocofiber nets but also in providing bioengineering services for foreign projects (a list of the company's international bioengineering projects is included in Appendix C).

## **Dealing With a Challenging Business Environment**

According to data from the Philippine Coconut Authority and the Philippine Department of Trade and Industry, there is a large unmet export market for cocofiber nets. However, while it pays up front, the low buying price and high cost of transportation diminish the profitability of the export market. Other exporting countries such as Sri Lanka and Vietnam are able to export their cocofibre products at a lower price than the Philippines because of lower production costs. To compound the problem, foreign customers also require production volumes that are beyond the capacity of CocoTech and its production partners. Based on these factors, CocoTech is focused on expanding the domestic market.

To increase domestic use of cocofibre products, Bo wrote and advocated the passage of Presidential Memorandum 25 (see Appendix D). The Memorandum was signed on September 2002 by President Arroyo, mandating the use of cocofiber products in all government infrastructure projects.



The Memorandum was significant for the industry because it helped ensure increased domestic demand. Most important, as cited above, the domestic market commands a higher price than the export market, translating to higher pay for the workers. As a basis for comparison, the domestic market pays US\$0.46 per square meter of cocofiber nets, landed Manila, while the export price dips to \$0.32 per square meter, landed country of destination.

While the total number of projects in 2003 was higher (nine) than in 2002 (seven), the total value (US\$500,000) was lower than the US\$1.2 million in 2002, in that many of the projects in 2003 were small-scale. This was a calculated move by CocoTech, because a fire in early 2003 had gutted its main plant, destroying a large volume of its stock of coconets, which reduced its capacity to meet the volume requirements of large-scale projects. Figure 3 exhibits the company's performance over an 11-year period (see Appendix E for details).

While the presidential mandate has increased domestic demand, another obstacle remains: CocoTech's biggest client, the Department of Public Works and Highways (DPWH), takes an inordinately long time to pay for its purchase orders. This adversely affects the company's income stream and ability to pay its workers on time—a tremendous blow to worker morale especially because most of them depend on their earnings from CocoTech for their day-to-day needs. These challenges forced the company to diversify its product line (see Appendix F) and focus on bioengineering and consulting services, particularly on its expertise in designing large-scale soil erosion control projects abroad, which translate to increased orders for cocofiber nets. This allowed the company to grow despite the challenges. Earnings in 2005 totalled US\$320,000, with earnings for 2006 expected to reach \$500,000.

CocoTech saw the competitive advantage of the Philippines not just in exporting cocofiber but also in processing cocofiber into other coco-based products aside from coconets to stimulate the local economy (see Appendix G). “*We need to add value to cocofiber to provide more jobs for our communities,*” Bo emphasized.

## Testing the Bioengineering Technology

Recently, several partnerships with foreign companies and governments have been forged. In 2005, the Dutch government, along with a Dutch company, partnered with CocoTech (25 percent by CocoTech; 25 percent by the Dutch company and 50 percent by the Dutch government) to create an enterprise producing twines for doormats. Twines are sent from CocoTech in the Philippines to The Netherlands, where they are processed into doormats and then exported to other countries. Eventually the partners plan to carry out the entire process in the Philippines.



In 2005, CocoTech partnered with Guangzhou Kekai Technology Development Co. Ltd., a Chinese company, to carry out an experiment using cocofiber nets (instead of plastic nets) to cover the surface of a Chinese landfill. The project was worth about US\$100,000 in cocofiber nets and proved to be a huge success. Within eighteen months, the landfill was transformed into a beautiful, green park.

CocoTech has been invited by the Chinese Ministry of Agriculture to carry out experiments using cocofiber nets in anti-desertification of the Gobi Desert and in restoring riverbanks throughout the country (see Figure 4). An industry observer predicts that if just one of these two experiments succeeds, “*Our cocofiber processing workers would have jobs for the next 30 years.*” However, funding has not been secured to support the research studies on anti-desertification.



Figure 4: Demonstration site of anti-desertification project in the Gobi Desert

Also in 2005, CocoTech forged a joint venture with a Sri Lankan company, called EcoProtect Engineering Pvt. Ltd., to promote the use of cocofiber nets in Sri Lanka. By providing technical expertise in bioengineering applications, CocoTech receives 15 percent of profits from this new venture. Until CocoTech came along, Sri Lanka exported all of its cocofiber products. The devastation brought by the 2005 tsunami helped CocoTech convince the Sri Lankan government to use its own cocofiber nets to restore thousands of

hectares of destroyed landscape.

In the Philippines, after a devastating landslide in Leyte, CocoTech was hired by a private European organization to install coconets on the hillsides and mountains whose collapse wiped out entire villages. In addition, Cocotech’s coco-peat products were used to help restore the farmlands that had all but disappeared. Today, the mountains and hillsides are sprouting vegetations, and farmlands are once again retuning to productive uses, albeit not as yet fully restored to their original conditions (see Figure 5). The most important thing is that land and soil have been rejuvenated and will be in better condition than before the disaster.

**Figure 5: Rehabilitating the hillsides**





CocoTech is proud of its pool of talented Filipino engineers working on the company's various experimental projects abroad. However, investment is needed to train more engineers in the emerging technology of bioengineering.

## Measuring the Impacts of CocoTech

### COMMUNITIES AS VITAL BUSINESS PARTNERS

The community has been a vital partner of the company. *“Without the community of coconut farmers, we have no business. And we wouldn't be in this business if it were not for them,”* Bo muses. Partnerships with coconut farmers' cooperatives provide a sustainable supply of waste coconut husks and a pool of local business partners which forms the supply chain of the company.

The local government units also play a critical facilitating role in the entire operations. For example, community leaders are often the arbiters to settle complaints and conflicts between the working families, the company, and the community. They also help facilitate training programmes, workshops and demo installations, leading to increased local use of coconut fibre products.

### TRANSFORMING THE COCONUT FARMERS INTO SELF-RELIANT COMMUNITIES: A DIRECT POSITIVE IMPACT OF COCOTECH

As mentioned earlier, one household earns up to US\$5 per day— from a base of \$1 a day. A study conducted by Bicol University indicated that where there are twining and weaving activities, there are also *sari-sari* (general merchandise) stores; where there are no such activities, there are no stores. This suggests that an economic activity such as weaving and twining spur economic growth. It also suggests a multiplier effect: from the families supplying the material to the company, to local enterprises.

The advent of cocofiber products has not only invigorated the depressed coconut farming industry, but has also created an entirely new industry that has, in turn, spawned new local enterprises.

### EMPOWERMENT OF WOMEN

Women play a critical role in the supply chain as they represent 85 percent of CocoTech's workforce. The cocofiber processing allows them to work out of their homes, keeping them accessible to their children. Their newfound financial independence has helped them to gain access to credit, join cooperatives and become less dependent on their husbands. The most dramatic and significant aspects are the intangible impacts on women: acquiring a sense of self-importance and increased self-esteem, because they bring in additional resources for the family.

The company's activities have also contributed to the reduction of juvenile delinquency through employment of out-of-school youth (ages 18 and up). Further, in many communities



where CocoTech and partners have operations, there has been a significant reduction in smoking among men and women because they have been made to understand that cocofiber is a highly flammable material.

## VALUE PROPOSITION FOR OTHER STAKEHOLDERS

Aside from the families involved in the company's supply chain, the local government benefits also. Formerly economically stagnant towns have been transformed into vibrant communities. Local shops enjoy increased sales which translate to higher taxes paid to the local government coffers. In addition, local farmers' cooperatives, many of them on the verge of collapse a few years ago, have increased membership through more contributions to capital build-up— a significant development especially because in the Philippines less than ten percent of cooperatives survive.<sup>8</sup>

Continued collaboration with academic institutions, especially the engineering and agriculture departments of major universities in the country, have led to improved equipment and processes, new technology discoveries and a pool of qualified engineering graduates, 12 of whom have joined CocoTech so far.

## Reaping the Fruits of Hard Work



In November 2005, Bo Arboleda won first prize at the First World Challenge Competition sponsored by BBC World Television and the Royal Dutch Shell Corporation for his pioneering work in soil erosion control through the use of cocofiber nets.

Bo shared his insights about winning the award, *“The money that we won (US\$20,000 cash) was important to a small and growing company like us. But what was more meaningful to me was the idea*

*that through the award, it will be much easier to promote coco fiber products throughout the world, which will help reduce poverty in coconut-producing countries because more jobs would be created in processing these products.”* In a tribute to his workers, Bo added, *“Winning first prize was a great honor not only for me but for the Philippines and for our business partners, the farmers.”*

## Challenges & Constraints

### AT THE COMPANY LEVEL

- SMEs are often unable to borrow money even from government financing institutions because of requirements for collateral (usually in the form of real estate).

<sup>8</sup> Data from the Cooperative Development Authority, Aklan.



- The cost of domestic shipping is often unaffordable for local entrepreneurs.
- The domestic market pays a higher price, but payment and collection, particularly from the public sector, can be a lengthy and expensive process.
- The export market pays up-front, but international competition makes the price too low and requires production volumes beyond the capability of CocoTech.
- Funding is needed to support research studies in anti-desertification, to complement the pilot project in the Gobi Desert in Mongolia; if the pilot project is proven feasible, demand for cocofiber nets would outstrip global supply.
- Funding is needed to train engineers and others in bioengineering.
- Funding is needed to support skills training workshops on twining and weaving as a means to expand the current worker base.

#### **AT THE LOCAL MARKET LEVEL**

- There is limited knowledge among the country's potential users of coconets and their beneficial effects on the environment, rural economies and the coconut industry in general.
- Despite the issuance of Presidential Memorandum 25 mandating the use of cocofiber nets on all government infrastructure projects, implementation by the DPWH has been slow and inadequate.
- There is a need to promote the use of coconut dust-based organic fertilizer and soil enhancer, especially as the country's agricultural sector lacks access to affordable and environment- friendly fertilizer. According to the Philippine Coconut Authority, global demand is expected to rise especially now that the European Union members have banned the use of peat moss in favour of coconut dust or cocopeat.
- Lack of uptake for cocofiber nets has led to increased costs of infrastructure projects because materials for soil erosion control and soil stabilization are often imported; for example, the cost of shot-crete (made of steel wire sprayed by concrete) is almost three-times that of cocofiber nets and cocopeat.

#### **AT THE INDUSTRY LEVEL**

- There is a need to form an international consortium of cocofiber product producers in order to extract more equitable prices in the export market, as well as to ensure fair and sound labour practices.

#### **AT THE BUSINESS ENVIRONMENT LEVEL**

- The cost of doing business in the Philippines is relatively high, due to excessive bureaucracy and lack of transparency in negotiating/awarding contracts. This reduces the potential to generate a higher income for coconut farmers.
- A lack of national quality standards for cocofiber nets left small producers at the mercy of the DPWH. Fortunately, as a result of Bo's contribution in preparing the data, the DPWH finally released the national standards for coconets and cocopeat in September 2006.



## Conclusion: The Important Adventure

Bo Arboleda named his original company Juboken, representing his name and those of his wife and son. He then realized that in the Japanese language— in which he is fluent- *Ju* means important and *boken* means adventure. Indeed, for this visionary who was once a political activist and a detainee during the Marcos martial law period— which forced him to study abroad— Juboken was but a continuation of his life’s dream to help the poor. This became the perfect name for a company that symbolizes his hope and the hopes of thousands of coconut farmers.



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Workers and their families, chairwoman of coconut farmers’ cooperative, school principal, and town Mayor, SRE facility in Aklan. 27 to 30 September 2006.

*Photographs courtesy of CocoTech and SRE*



## Appendix A: Coco Fiber Processing

**Step 1. Gathering of waste coconut husks**



**Step 2. Decorticating the husks**



**Step 3. Packing and Distribution of Cocofiber to the community**



**Step 4. Twining**



**Step 5. Weaving**

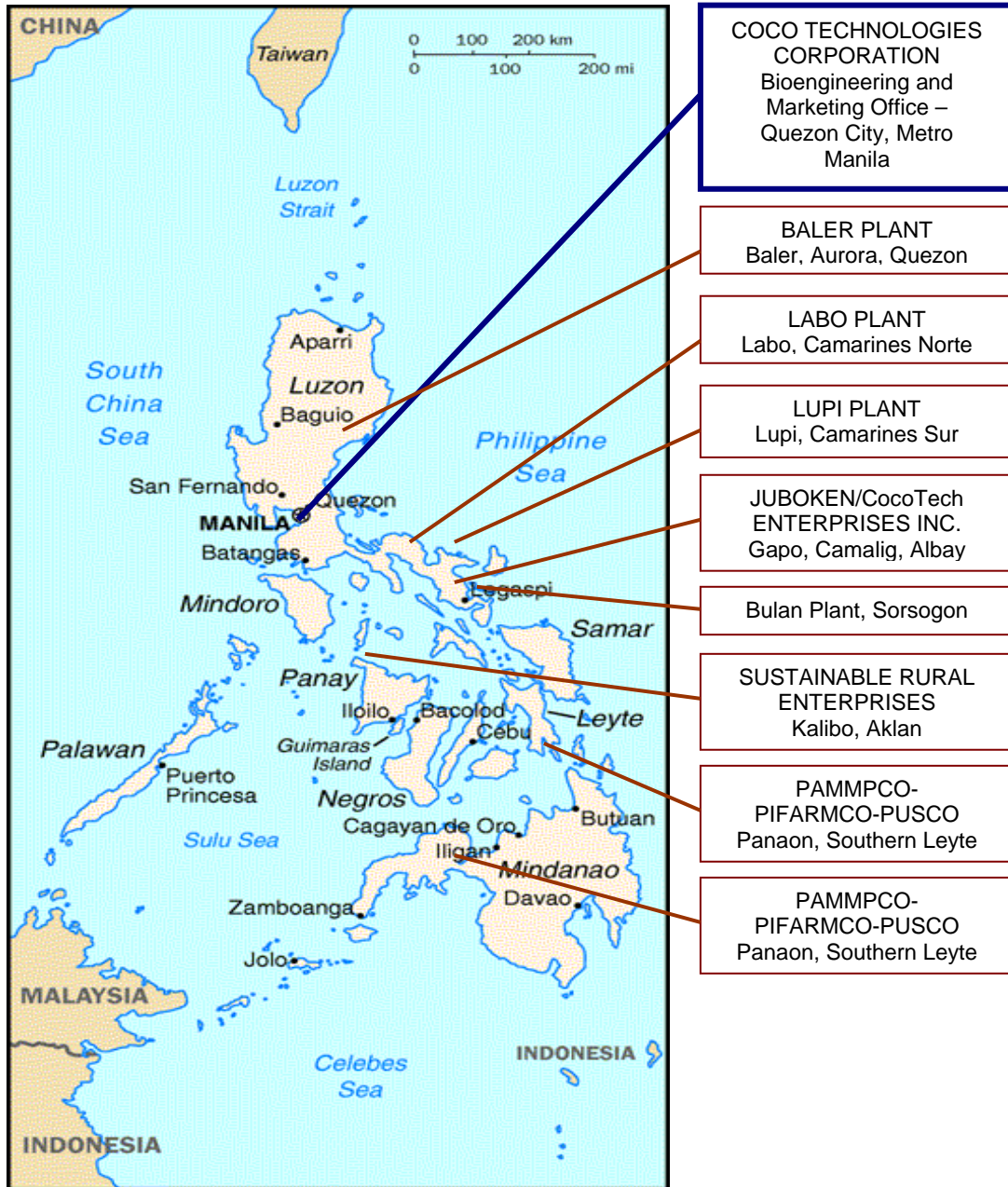


**Step 6. Finished nets**





## Appendix B: Map of the Philippines Islands and CocoTech's Areas of Operation and Partners





**Appendix C: List of CocoTech international service projects**

<b>Country</b>	<b>Implementing Company/ Partner</b>	<b>Name of Projects</b>
<b>Germany and the Netherlands</b>	Bestmann Bioengineering Company	Wedel River Rehabilitation Elbe River Bank Rehabilitation Berlin Bypass Greening Project Schipol Airport Creek Rehabilitation Erfurt Central Park River Rehabilitation
<b>Japan</b>	Fujimi Green Engineering MIC Corporation	Shimizu River Lake Biwa Inage Creek Kobe River Edo River Umegaoka River Yokohama River Kanda River Fujigaoka River
<b>United States</b>	Bio-Engineering Group Bonterra America	Tennessee River Mississippi River Washington River Buffalo Creek Nashua River Wilson Greatbatch Wetland Project Beacon Heights Landfill
<b>Malaysia</b>	Agrumaju Bhd.	Petalinjaya Industrial Park River
<b>China</b>	Guangzhou Rivers Enterprises Co., Ltd Ecogreen Fuyang Golf Inc.	Artificial Wetland Project Mongolia Desert Rehabilitation Piloting Project Fuyang Golf Course
<b>Sri Lanka</b>	<a href="#">EcoProtect</a> -Cocotech	Southern Highway Road Protection Project Kumagai-Gumi Slope Protection Horana Slope Protection



## Appendix D: Presidential Memorandum No. 25

### OFFICE OF THE PRESIDENT OF THE PHILIPPINES

Malacañang

Manila, September 2, 2002

#### MEMORANDUM CIRCULAR NO. 25

DIRECTING ALL NATIONAL AND LOCAL GOVERNMENT AGENCIES, BUREAUS, AND OTHER INSTRUMENTALITIES INCLUDING AGRICULTURAL INSTITUTIONS AND COUNCILS TO USE COCO PEAT OR COIR DUST AND COCONUT FIBER MATERIALS FOR SOIL CONDITIONING AND EROSION CONTROL.

In line with the program to promote better farm practices and environment conservation to mitigate the effect of drought during El Niño years, all heads of National and Local Government agencies, bureaus, and instrumentalities including Government institutions and councils involved in the implementation of farming programs are hereby directed to prescribe the use of coco peat and other coconut husk materials in farming and horticulture as effective soil conditioner and water moisture conservator.

Likewise, the use of geo-textiles and bio-logs or fascines made from coir or coconut fiber is hereby prescribed for use in infrastructure and public work projects for soil erosion control, more particularly of the Department of Public Works and Highways. These coir products, proven for their high tensile strength, are abundant, available, and biodegradable.

The use of coir will further provide additional income to coconut farmers and generate more jobs in the countryside.

The Department of Agriculture, the Department of Public Works and Highways and the Philippine Coconut Authority shall issue the corresponding Implementing Guidelines within thirty (30) days from the date of issuance of this Memorandum Circular.

For strict compliance.

Manila, September 2, 2002

By the President:

(Signed) **ALBERTO G. ROMULO**

*Executive Secretary*



### Appendix E: CocoTech's Project Performance

Year of Operation	No of Projects	Value of Projects (in Php)
1996	1	750,000.00
1997	3	8,246,000.00
1998	2	8,265,000.00
1999	4	2,073,000.00
2000	4	6,361,000.00
2001	6	7,503,866.00
2002	6	66,740,000.00
2003	9	25,000,000.00
2004	8	15,200,000.00
2005	7	13,600,000.00
2006	18	16,499,983.34
<b>TOTAL</b>		<b>170,238,849.34</b>
<b>US\$</b>		<b>3,404,776.99</b>



## Appendix F: List of products and services

	<p><b>A. EROSION CONTROL: COCONETS, ROLLS, WATTLES &amp; INTERLOCKING BLOCKS</b></p>
	<ul style="list-style-type: none"> <li>• Riverbank Protection</li> <li>• Shoreline &amp; Mangrove Protection &amp; Rehabilitation</li> <li>• Road slope protection</li> <li>• Steep slope protection and erosion control</li> <li>• Waste management</li> <li>• Wastewater purification</li> <li>• Shoreline and mangrove protection and rehabilitation</li> <li>• Grass mat production</li> </ul> <p><b>B. GROWING MEDIA: COCO BRICKS &amp; BLOCKS</b></p> <ul style="list-style-type: none"> <li>• Cocopeat block and bricks are used as construction materials. Cocopeat is one coconut husk is 35% fiber and 65% dust). It has excellent water-absorption capability (8 times its weight)</li> <li>• Coco pot – is an environment friendly, organic seedling propagation pots</li> <li>• Wattle – coco fibers stuffed in nets, designed to hood orchids and other hanging plants</li> <li>• Grow pole – is used for vines and creeping plants</li> </ul> <p>Cocopeat – the use of coconut dust as soil enhancer and mulch (stays more than 10 years in the soil; improves soil texture/structure, insulates roots from extreme temperatures, promotes microbial and root growth, absorbs strong, unpleasant odors).</p>
	<p><b>C. OTHER PRODUCTS</b></p> <ul style="list-style-type: none"> <li>• Coir twines - <i>for agricultural, industrial &amp; home applications</i></li> <li>• Plant Hangers - <i>for agricultural and home use</i></li> <li>• Caps and Bags - <i>for fashion and occasions</i></li> </ul> <p>Other innovative uses of CocoTech's cocofiber nets include:</p> <ul style="list-style-type: none"> <li>• As a substitute for sand filters, which is now being used by Manila Water.</li> <li>• As a substitute for synthetic and petroleum-based filters at a water filtration system which was tested and used in South Korea.</li> <li>• Restoration of a landfill project in Guangzhou by replacing the plastic net covering. The coconets were embedded with plant and flower seeds. So effective was the experiment that the landfill has been transformed into a beautiful park.</li> </ul>



### Appendix G: Coconut husks products



Coco pots



Cocopeat



Plant liner



Brush



rope

Car seat



Grow poles



Liner





September 2007

The information presented in this case study has been reviewed and signed-off by the company to ensure its accuracy. The views expressed in the case study are the ones of the author and do not necessarily reflect those of the UN, UNDP or their Member States.

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