

Charcoal to Preserve Wood

By Gunter Pauli

This article introduces a creative approach to the production of charcoal as one of the 100 innovations that shape "The Blue Economy". This article is part of a broad effort to stimulate entrepreneurship, competitiveness and employment.

The Market

The world market for charcoal is estimated at \$6.8 billion dollars in 2010. Its value could have reached more than \$15 billion according to estimates if we include informal sales. Some development economists argue that 70 percent of charcoal is not accounted for in national statistics. The Food and Agriculture Organization (FAO) of the United Nations estimates that 2.4 billion people still rely on wood and charcoal for their daily fuel.

Charcoal manufacturing has been labeled as the world's first industry (unrelated to the world's oldest profession). Demand for charcoal continues to increase in Latin America and Africa, while it drops in Asia, and remains stable in the industrialized world where its recreational use is concentrated over the summer months. While consumption has declined over the years throughout Europe, demand has stabilized at around one million tons each year. The United Kingdom imports 60,000 tons, and over 90 percent is sourced in Africa, mainly from Nigeria. Contrary to Western Europe, the United States remains a major manufacturer of charcoal, producing just under one million tons a year, earning a ranking amongst the ten largest charcoal manufacturing countries of the world.

The globe's largest producer of charcoal is Brazil, making over 13 million tons, well ahead of Nigeria and Ethiopia which jockey for leadership in Africa with each around 3.5 million tons annually. Since only 4 percent of world's electricity is produced in Africa, and only 8 percent of communities in rural sub-Saharan Africa have access to electricity, over 70 percent of the population's income is spent on fuel. This reality guarantees a stable demand and a solid return on investment. Africa cuts an estimated 4 million hectares of forest to produce charcoal each year, double the average of any other region, including Brazil. A city like Abidjan, the Capital of Ivory Coast consumes 300,000 tons of charcoal per year, while Kenyan employment experts advance that charcoal production accounts for 200,000 jobs nationwide. Each day 20,000 bags weighing four to five kilograms each enter Dar es Salaam, the Capital of Tanzania valued annually at \$40 million fueling the local economy and livelihood jobs while contaminating the air and destroying the local forests.

The Innovation

Deforestation has caught the world's attention. However charcoal is an improvement since in most circumstances it replaces even more destructive practice of wood burning. Still, charcoal production has been recognized as one of the prime reasons for environmental degradation, including the loss of habitat for primates. Brazil has responded with the planting of eucalyptus trees, which thanks to a higher level of productivity could potentially reduce demand for hardwood from the rainforest. It has been estimated that each 100,000 hectares of eucalyptus forest in Minas Gerais (Brazil), harvested every seven years could save one million hectares of rainforest over a century. Additional innovations include the use of coconut husks, saw dust, pulp and paper left-overs as raw material for charcoal. Alternative fuels like bamboo have also been promoted, however the stress on deforestation remains.

Antonio Giraldo studied bamboo in his native Quindio, in the heart of Colombia and learned from reports how the Chinese and the Japanese preserved wood slowly over the 60 years using the smoke of charcoal to create a natural biochemical protection against termites and fungus. The oldest buildings in Kyoto use structural bamboo that has been standing for five centuries. He went on to design simplified versions of these open ovens that permit the production of charcoal in a lower chamber, while the fumes that are harmful to the environment, are trapped in the upper chamber where running water along the walls forces an ongoing condensation and evaporation cycle that slowly but steadily impregnates the giant Colombian bamboos.

Bamboo regained popularity as a structural building material, especially after its approval as a building material in Germany in the year 2000. Thanks to this development, and based on the innovative engineering of Antonio Giraldo, processing of bamboo has taken new dimensions: the structural part is preserved with the fumes generated from the charcoal production that solely uses the non-structural parts of the 25 meter long *Guadua angustifolia*. This total use of bamboo stems, including its juice as substitute for chemicals, resembles the basic principles of The Blue Economy, i.e. the cascading material and energy generating multiple benefits and revenues.

The First Cash Flow

Antonio Giraldo built the first unit in 1999 and quickly gained interest in his technique to fully use giant bamboos. He would push the production system even further, retrieving larger pieces of bamboo for the production of household items, and only converting the left-overs into charcoal. The bamboo charcoal bricks compete in calorific value with any other, while his preserved bamboo attracted broad popularity thanks to the soft smell of burned wood. The original investment of \$25,000 became a benchmark for the innovative approach to resource management, reducing the stress on forests, eliminating the use of toxic chemicals, and rendering bamboo popular thanks to a guaranteed extended life.

The Opportunity

The business strengthened, and so did the interest in Antonio's technical prowess. When the United States suffered increasingly from forest fires from Colorado to California, the State of New Mexico decided to remove the small diameter wood from high risk forests. While the removed wood would at first be left to rot, or at best incinerated under controlled conditions, Antonio's double chamber oven was retained as the next step in the value chain. Picuris Pueblo in New Mexico was the first to experiment with the conversion of defunct containers, filled with wood debris to be converted into charcoal, whereas a second container, filled with fine wood - also removed from the forest with a maximum diameter of 7 inches - would be preserved by the trapped gases. The technique was proven commercially viable in the United States, and the use of defunct containers secured a double income, and a higher quality (healthier) product.

While on one hand there is a strong demand for charcoal, there are tremendous resources available to supply the efficient fuel charcoal represents. Bamboo produces per hectare per year over a 70 year period 12 times more charcoal of comparable quality than the most productive eucalyptus, thus potentially saving 12 million hectares of rainforest over its lifetime. Actually, under these conditions, it is not even worth destroying the rainforest as a source of revenue - if the goal is accessing charcoal. Since most of the countries that have a high demand for charcoal also have native bamboo, it makes sense to opt for the planting of this most prolific grass (bamboo is not a plant) as a source of charcoal. At the same time, bamboo serves as an exceptional building material, a management tool for hydrological cycles and now also as a preservation agent.

At the same time, the Native Americans at the Pueblo in New Mexico demonstrated that even in a temperate climate, Antonio's charcoal production technique designed for bamboo but adapted to wood could benefit our approach to the control of forest fires which devastate not only America, but also Southern Europe, Africa and increasingly Latin America. This means that thousands of entrepreneurs could engage in this innovative business model in major parts of the world supplying a product in high demand while regenerating the original cover of bamboo forests that once adorned our Earth.

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Further information on the 100 innovations at www.theblueeconomy.org

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