



Case 96

The Magic of Hot Chili

This article introduces innovations in pesticides that shape “The Blue Economy”, which is known as ZERI’s philosophy in action. This article is of part of a broad effort by the author and the designer of the Blue Economy to stimulate open source entrepreneurship, competitiveness and employment. For more information about the origin of ZERI <www.zeri.org>

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The World Market for Pesticides

The world market for pest controls in 2010 reached \$45 billion up from \$32.5 billion in 2001. The sector around the world has been expanding at above inflation rate. If we expand the use of chemicals to herbicides, fungicides and disinfectants for agriculture then the worldwide sales increases to \$270 billion. Two thirds of the consumption of pesticides is concentrated in OECD member countries, while China is the largest individual country with +20 percent of the world’s appetite for this product range. The US market represents with \$11 billion in sales one quarter of the global sales. There are more than 110,000 employees and 21,500 companies in the American industry.

The largest pesticide producer in the world is BAYER with plus \$8 billion in sales according to the last public data available, closely followed by Syngenta (Switzerland), each representing approximately 20 percent of the world’s turnover. BASF, Dow, Monsanto and Dupont are important players on the pesticide market where the top ten manufacturers represent more than 85 percent of worldwide sales. State owned ChemChina acquired Israel’s Makhteshim Agan Group, the world’s largest maker of generic pesticides for \$2.4 billion. It is interesting that Monsanto is also the largest seed producer in the world, closely followed by Dupont (#2) and Syngenta (#3).

Worldwide approximately 9,000 species of insects and 8,000 species of weeds affect the productivity of monoculture crops. Insect pests cause an estimated 14 percent annual crop losses, and weeds account for 13 percent. The world’s leading seed and pest control companies are increasingly collaborating generating an income from either the seeds that are manipulated to resist pests, or from the sales of chemicals to control



the side-effects of industrial farming. Monsanto and BASF pursue a \$1.5 billion cooperation scheme, a deal comparable to the close relations forged between Monsanto and Dow. Monsanto and Syngenta agreed to stop their legal battles and cross-license their intellectual property, while Syngenta and Dupont opted to combine their pesticide portfolio. One has a hard time not imagining that there is a cartel of production that has avoided scrutiny from authorities.

The Innovation

The indiscriminate use of chemicals on crops has caused irreparable damage to ecosystems and wildlife in general, adversely affecting amphibian and bird life leading to the extinction or the endangering of multiple species. Pesticide use is also the root cause of numerous health issues that were first exposed by Rachel Carson in her epoch-making book “Silent Spring” published already in 1964 that led to the banning of DDT, the standard pesticide in those days. One of the first innovations was the introduction of pest specific chemicals, instead of the blanket approach. In the case of cotton, this innovation reduced the number of pesticide sprayings from 20 to 40 times per year to only 4 to 5 per year cutting labor costs while reducing the dispersion of chemicals. One of the more creative solutions to pest control is the protective nets like the ones developed by Avi Klayman in Israel that provide the right amount of sun and air to the tomatoes while pests that would ever get through the barrier would be immediately immobilized through a light filter. Today, most fruit imported from Central and South America has been netted or bagged with a material that is impregnated with pesticides, rather than sprayed. This offers fruit farmers a rare opportunity to combine the use of pesticides in a very controlled way while successfully obtaining the organic label. The draw back is cost.

Dr. José Oscar Gutiérrez Montes was born in Cali (Colombia) and studied medicine at the Universidad del Valle (Cali). Later, he obtained a master degree in pharmacology from the same university where he went on to become professor. He worked at the General Hospital of Edinburgh in 1985 while taking a post-graduate course on internal medicine at the University of Edinburgh (UK). Dr. Gutiérrez worked for a year at Cornell University (New York, USA) with a postgraduate fellowship studying the function of membranes. When he read in 2007 the research published in the Biochemical and Biophysical Research Communications by the University of Nottingham that vanilloids, a family of molecules of capsaicin, extracted from hot chili peppers could adhere to the proteins in the mitochondria of a cancerous cell and cause an apoptosis, the self-destruction of the cell, he decided to build on these findings and compare with his own experiences.

Dr. Gutiérrez remembered all too well the traditional use of chili peppers (*Capsicum spp.*) as a pain killer thanks to the stimulus of blood circulation. He applied extracts as a skin treatment, reducing and in some cases eliminating skin scars especially from



burns. The documentation of the positive effects based on anecdotal evidence and scientific studies accumulated over the years and Dr. Gutiérrez decided to focus on the possible applications provided he could secure enough supply. He knew that the cultivation of chili is easy, needs little land, can be intercropped, and does not even require quality soil, while it generates jobs. Each hectare of chili planted requires five employees and with over 10,000 HA of land readily available, he looked at the potential to generate +50,000 jobs. When he realized that supply was not the problem, he was confronted with the lack of financial resources to undertake the clinical tests indispensable to access the high value pharmaceutical market.

The First Cash Flow

Dr. Gutiérrez went on to create the company Capsacorp SA in Cali and embarked on an integrated scheme to produce cosmetic products for the local market based on local supply, while motivating farmers to increase output so that he could ensure the quality and the cost of locally processed capsaicin. Capsaicin extract is an established raw material for well known products such as Tabasco and dermal patches to relieve pain, and a topical anesthetic against arthritis. Capsaicin is even used as an active ingredient in riot control and personal defense better known as pepper spray - however the content is not pepper but rather capsaicin. The successful operation from farm to intermediate product and maker of cosmetics earned Capsacor SA the 2009 award of “The Most Promising Exporter from Colombia”. His success with cosmetics offered a further growth to the company and permitted the financing of a laboratory that evolved from cosmetics to a wide range of opportunities building on the lifetime experience of Dr. Guterriéz as a pharmacist who authored (and co-authored) over 100 scientific published articles.

The Opportunity

On the occasion of the second Blue Economy workshop in Cali in May 2012, several producers joined to expose their potential within each sector. The set-up of nine sugarcane to ethanol production centers recently created a new economic activity within the sugar cane cluster, and while this had a positive impact in the region, the sector consumes for each liter of ethanol, ten liters of water. This contaminated water, with a high biological oxygen demand (BOD) is costly to treat jeopardizing the competitiveness of the output if international standards were imposed. Whereas this waste water is chemically safe, rich in nutrients, the sugarcane farms need water for irrigation. Transport of water by truck is a viable option, but an expensive one. The construction of local waste water treatment facilities is also draining too much capital. While the sugarcane industry in the department of the Valle del Cauca is the most productive in the world with two harvests a year and a need to replant this perennial sugar plants only once every eleven years, the search for higher levels of productivity hinges on a better integrated resource management especially water.



Hot chili peppers have already traditionally been used to control pests. Since most birds (with the exception of pigeons) are unaffected by capsaicin, insects seem to suffer from the presence of this biochemical. Tests have now indicated that the blending of capsaicin into the residual waters from ethanol manufacturing and its application on sugarcane land offers multiple benefits: the soil is replenished with organic matter, irrigated with process water, while a 0.03 percent offers a pest control from rats to bugs. The conversion of a waste water problem into a product with multiple benefits that can be locally used is a typical case of the Blue Economy. In view of the huge volumes of water available, and the proximity of the ethanol plants, one can now envision the creation of a local network of chili farmers and the local extraction of capsaicin with both bulk use for the average output, and high end use for the top quality. Considering that the cost of fertilizers and pesticides are next to labor the most expensive inputs, this would render the sugarcane sector more competitive by using water and plants that are locally available while generating a large number of jobs.

The opportunity to weave industries together, all based on easy and abundant farming exploiting the power of the tropics, could benefit from this bulk purchase of chili that renders the fertilizer and pest control market into an engine of development, while eliminating the need for importation. The bulk could be purchased by the suppliers of the sugar cane sector to produce nutrient enriched insect and fungus controls. When the quality of extraction increases then the output can selectively be transformed into higher capsaicin derived products offered a lower risk on investments and a higher revenue potential for the farmers.

Dr. Gutiérrez already expanded his research beyond a series of cosmetic products for which he obtained the Award as the “Best (innovative) Research in Plastic Surgery” from the Peruvian surgeons. While he never considered beauty his priority, he could demonstrate the success on the market thus preparing the avenue for a cash flow that will permit him to deploy his insights and know-how into his preferred medical field such as pain relievers, dental care, obesity control, gastro-intestinal care, post-surgical treatments, and hemorrhoids ailment. Dr. Gutiérrez believes that time has come these insights do not remain the domain of one, but should be part of a development platform for entrepreneurs that could render his home region in Colombia into a prosperous one, building on what it has: abundance.

Gunter Pauli is the author of the Report to the Club of Rome:

“Blue Economy: 100 Innovations - 10 years - 100 million jobs” published in 35 languages worldwide.

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For further background on the 100 cases: www.TheBlueEconomy.org