BIOFUELS, CARBON AND TRADE:

LEADERSHIP CHALLENGES FOR THE INTERDEPENDENT AMERICAS

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PRESENTER BACKGROUNDS AND ABSTRACTS

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Initiative for Renewable Energy and the Environment

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Expert on Energy Policies for Sustainable Development for Latin America and the Caribbean. Working on reforms and regulation in energy sector. Holds a Ph.D in Energy Economic form University of Grenoble France. Former Professor and Vice-president of Bariloche Foundation. Has participated in several Post Graduate Courses on Economy and Energy Planning, in Canada, Africa and Latin American. Dr. Altomonte has several publications and has participated in numerous international congresses and seminars. In addition, he has been the Principal Technical Advisor of the OLADE-UNDP Cooperation Project.

ABSTRACT: Public policies for promoting biofuels in the Latin America and Caribbean countries.

Several Governments in Latin America and the Caribbean as well as other regions in the world have approved, or are in the process of approving, laws and regulations for ethanol and biodiesel use in a mix with other fuels. Because of its climate and relative abundance of land and water, as well as having a tradition with the growing of several potential biofuel crops, the Latin American and Caribbean region has particular comparative advantages in relation to biofuel crops and in becoming an important player in biofuels production.

Countries such as Argentina, Costa Rica, Colombia, El Salvador, Jamaica, Mexico, Nicaragua, Paraguay, Peru, and Venezuela have adopted biofuels programs (ethanol-biodiesel) or are planning to do so. However, the feasibility and the potential impact of producing and using biofuel on a large scale still raises numerous unanswered questions at all levels of the production chain and in terms of pubic policy implications. The presentation will show that public policies require an official commitment of the government together with an integral system of obligations, subsidies, and incentives, to promote big investments in infrastructure and development.

The three "main dimensions" of the sustainability of biofuels production (energy, agriculture and environment) were split in ten axes to analyze the contribution of biofuels production to sustainable development of each country or situation: **Energy; Agriculture; Industry; Macroeconomic; Technological development; Use of Natural Resources; Local and global emissions; Security in food provision; Employment and income distribution; Local development. Radar graph will be presented to show different situation (countries having common characteristics of biofuel production chain)**.

RENÉ CASTRO, Ph.D.

Sustainable Development professor at INCAE and former Costa Rica Ministry of Environment and Energy

Dr. Castro holds a doctorate in Design from Harvard University, with an emphasis on Natural Resource Economics and Sustainable Development, and obtained a Master's Degree from the same university. He graduated as a civil engineer from the University of Costa Rica. Dr. Castro has held various positions in the Costa Rican government: Minister of Environment and Energy, deputy-minister of the Ministry of Governance, National Director of the Ministry of Transportation and Public Works, President of the San José City Council. He served as chief of Costa Rican delegations to the international conventions on Biodiversity, Climatic Change and Ozone. He is often invited as professor and lecturer to INCAE University and Harvard University and since 1998 has acted as international consultant for the United NationsDevelopment Programme (UNPD). Castro has worked and presented conferences in more than 60 countries. He is the author of short books on railroads and aviation and has coauthored the books "Evaluación de Proyectos Ambientales" and "Evaluación de Impacto Ambiental y Sostenibilidad del Desarrollo". His most recent book, "Valoración de los servicios ambientales del Bosque: El Caso de Cambio Climático" is based on his doctoral thesis and presents one of the few studies that link ecology of the tropical forests with their economic potential and the global environmental markets. He is also the author of numerous special cases and articles used for teaching at the INCAE and the Harvard University.

ABSTRACT: Farming Biofuels in Central America[1]

Central America is a small region of 6 countries of around 522,000 km2 and 50 Million inhabitants. It has not escaped the world trend of oil dependency. The region is completely dependent on oil for transportation, and vehicle use is growing dramatically. For example, in ten years the vehicle fleet grew from one vehicle for every twenty people to one for every ten people in El Salvador and to one every four people in Costa Rica. In addition, the regional average level fossil fuel use for electrical generation grew from 10% in 1990 to 42% in 2004.

The economic implications for the region when oil prices went from $20 a barrel in 1999 to $87 in 2007 are devastating. The region's total oil purchases increased from $2.6 billion in 2002 to $6.7 billion in 2007. In some countries, such as Honduras and Nicaragua, more than 10% of their GDP is annually consumed in fuel, more than what they invest in education. In Costa Rica represents 5 % of the GDP, it still is very large if compare with the goal of investing 8% in public primary and high schools, or taking into account that this the only country in the region which uses mainly electricity from renewable sources.

Due to this situation, the governments in the region are interested in promoting biofuel production. There are several private initiatives to produce biofuels from sugarcane, African palm, and other non-edibles, like castor bean, coquillo plants (Jatropha Curcas L).

Generating energy from native sources, like biofuels, has many benefits. It increases confidence in local supply and makes prices more predictable; it reduces dependence on other countries and

in the availability of foreign currency; and it decreases risks through a diversification of portfolio sources. But this new biofuel opportunity should be taken on a sustainable way, evaluating possible conflicts with food production and nature conservation. The region's countries should make sure that these fuels are planted on land that is not being used to grow food. Environmentally, they have to make sure they are not displacing natural forests with crops.

In terms of energy and competitiveness, we should choose alternatives with a positive energy balance (see Table #1). In other words, the whole process should generate more energy than it consumes (in the form of fertilizers, fuel for planting, harvesting and producing the biofuel).

Today, bioethanol from corn produced in the US, producer little to no extra energy since each barrel used produces a maximum of 1.2 barrel equivalents. Fortunately, our sugarcane bioethanol and biodiesel from the African palm have higher positive energy balances: 7 and 9 times the energy units consumed.

Table #1 – Comparative Matrix: Biofuels

Region	Volume produced	Productivity	Energy balance*	Food vs. Biofuels vs. Nature
Brazil	Bioethanol from sugarcane: very large volume	High	> 8.3	Option for good balance, but need clear policies against deforestation
Central America	Bioethanol from sugarcane: low Biodiesel from palm: medium	Medium	7 - 8 > 9	Limited land Biofuel vs. Nature balance is not easy
US	Bioethanol from corn: very large and popular	Low	0.9 - 1.2	Very inefficient food vs. biofuel

* Barrels of oil equivalents for each barrel invested in planting, cultivating and production of biofuel.

Financial Analysis

Using information provided by producers, an INCAE colleague found that Panama can only be competitive if oil prices go over $50 a barrel (see Table #2). In addition, he found that if the country was to commercialize its CO2 emission reductions, it could compete for prices over $43.

Central America's competitive position for biofuel using African palm oil may only be temporary. It provides around 1.8% of the world market, while Malaysia and Indonesia produce close to 80%. However, it is probable that free trade agreements will open a window of opportunity to export oil or biodiesel to the US.

Finally, some recent research by INBIO (National Biodiversity institute), a Costa Rican NGO, shows that energy produced by tropical termites is a very efficient and competitive source of energy; currently they patented the product and are working in the economic feasibility analysis. INCAE and INBIO work in a very close partnership.

Table #2: Balance Price for Bioethanol Production in Panama

Balance Price	US $/gallon	US $/barrel
Only production	1.39	@ 50.9 USD/Bbl
Production + Planting	1.19	@ 46.4 USD/Bbl
Production + Planting + CER*	1.06	@ 43.2 USD/Bbl

* A scenario with high CER prices is highly uncertain

Source: Study by Pavel Molina from INCAE Business School (2007)

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[1]*This abstract is part of an article written by **Dr. René Castro** along with **Leo Miguel Guevara**, who received a degree in civil engineering from the Universidad Metropolitana from Venezuela. He received his Masters in Business Administration from INCAE Business School. He has worked in Venezuela's private energy sector, managing consultancies and construction projects in the petroleum and hydroelectricity industries. He is currently a researcher at INCAE, working in the field of sustainable development; and **Ana Lucía Alfaro** who received a degree in chemical engineering from the Universidad de Costa Rica. She made specialty studies on Sustainable Development in INCAE Business School and specialty studies on Sustainable Energy Policies in Germany. She worked for an environmental consulting firm in Costa Rica and currently is a researcher at INCAE, working in the field of renewable energies and sustainable development.)*

Some facts come from a previous article published by Castro and Guevara in September 2007, in Summa Magazine.

CRAIG COX

Executive Director, Soil and Water Conservation Society

Craig has devoted his working life to natural resource conservation beginning in 1977 when he joined the Minnesota Department of Natural Resources as a field biologist. Since that time he has served as Senior Staff Officer with the Board on Agriculture of the National Academy of Sciences; Professional Staff Member of the Senate Committee on Agriculture, Nutrition and Forestry; Special Assistant to the Chief of USDA's Natural Resource Conservation Service; and briefly as Acting Deputy Undersecretary for Natural Resources and Environment at USDA. He is currently Executive Director of the Soil and Water Conservation Society -- a professional Society dedicated to promoting the art and science of natural resource conservation.

ABSTRACT: Promise and Peril of Biofuels: A Conservationist's View

Biofuel development holds both promise and peril for natural resources and the environment in agricultural landscapes. The community I represent—scientists, practitioners, and policy makers engaged in managing natural resources and the environment on agricultural land—has three primary concerns about biofuels.

The first concern is general uncertainty and/or substantial differences of opinion regarding the environmental implications and economic potential of biofuels. Opinions, some backed up with research, vary widely as to the realistic potential of biofuels to contribute to reducing dependence on fossil fuels, limiting greenhouse gas emissions, and enhancing soil and water resources. This uncertainty is exacerbated by widely ranging opinions about the economic viability of biofuels. Policy makers are facing important decisions regarding the allocation of public dollars and policy attention to a host of options for addressing fossil fuels, greenhouse gases, and soil and water conservation. It would be best to make those decisions based on a realistic and more broadly held estimate of what those investments will return in resource conservation and environmental quality.

The second concern is managing the natural resource and environmental implications of the biofuel industry we have today—largely the production of ethanol and biodiesel from corn and oilseeds. Intensification and expansion of row crop production will lead to increased soil and water resource degradation unless aggressive measures are taken to improve conservation and environmental management in agricultural landscapes. These resource and environmental implications can be managed, but evidence suggests they are not being managed. Current conservation policies and programs had not adequately addressed agriculture's natural resource and environmental challenges before the biofuel boom. Conservation and biofuels must go hand-in-hand or we are likely to harvest more peril than promise from the industry we have today.

The third and final concern among conservationists is to shape the future biofuel industry. A new generation of dedicated, cellulosic biofuel feedstocks holds great promise as a means to improve natural resources and the environment in agricultural landscapes. Indeed, perennial energy crops create opportunities to do things conservationists have wanted to do for decades. But—everything depends on what those feedstocks are, how they are produced and harvested, and where they are produced and harvested. If we are going to continue to subsidize or mandate biofuel production and use, then those subsidies or mandates should be tied to the environmental performance of those fuels—including standards and criteria for sustainable feedstock production systems. Such standards and criteria must be developed in the context of climate change. A more intense and variable climate regime will substantially increase the risk of soil degradation, water pollution, and destabilization of hydrologic systems. The standards we develop must focus on creating agricultural landscapes that are more resistant and resilient to such climate variation.

MARY ANN CURRAN, M.S.

Director of the Life Cycle Assessment (LCA) program- Office of Research and Development, U.S. Environmental Protection Agency (EPA)

As an internationally-recognized expert in LCA, Ms. Curran has worked closely with the Society of Environmental Toxicology and Chemistry (SETAC), which was instrumental in advancing LCA awareness worldwide. She continues to serve on the SETAC North America LCA Advisory Group as well as participating in the joint UNEP/SETAC Life Cycle Initiative. In addition, Ms. Curran serves as subject editor, Cleaner Production Tools, for the *Journal of Cleaner Production*, and is on the editorial boards of several technical journals, including the *International Journal of Life Cycle Assessment*, *Environmental Progress*, and *Management of Environmental Quality*. Since 1990, Ms. Curran has authored and co-authored numerous papers which address the LCA concept and its applications. She has presented EPA's activities in LCA research at venues across the U.S. and in Europe, Australia, Japan, and South Africa. She co-authored and edited a book, entitled "Environmental Life Cycle Assessment," published by McGraw-Hill in July 1996. Ms. Curran has been with the EPA's Office of Research and Development since 1980. She holds a Master of Science degree in Environmental Management and Policy from the International Institute for Industrial Environmental Economics (IIIEE) at Lund University, Lund, Sweden (1996) and a Bachelor of Science degree in Chemical Engineering, from the University of Cincinnati, Cincinnati, Ohio (1980). Ms. Curran is currently a candidate in Erasmus University's International PhD program on "Clean Products, Cleaner Production, Industrial Ecology and Sustainability."

ABSTRACT: **Bio-ethanol as a transportation fuel from a net energy, greenhouse gas, and environmental life cycle perspective**

In recent years, a large number of assessments have been conducted to assess the environmental merit of biofuels. Two detailed reviews present contrasting results: one is generally unfavorable, whilst the other is more favorable towards fuel bio-ethanol. However, most work that has been done so far, to assess the conversion of specific feedstocks to biofuels, specifically bio-ethanol, has not gone beyond energy and carbon assessments. In a search of the open literature (1996 - 2004), 47 published assessments were found that compare bio-ethanol systems to conventional fuel on a life cycle basis, or using life cycle assessment (LCA). A majority of these assessments focused on net energy and greenhouse gases, and despite differing assumptions and system boundaries, the following general lessons emerge: (i) make ethanol from sugar crops, in tropical countries, but approach expansion of agricultural land usage with extreme caution; (ii) consider hydrolysing and fermenting lignocellulosic residues to ethanol; and (iii) the LCA results on grasses as feedstock are insufficient to draw conclusions. It appears that technology choices in process residue handling and in fuel combustion are key, while site-specific environmental management tools should best handle biodiversity issues. Seven of the reviewed studies evaluated a wider range of environmental impacts, including resource depletion, global warming, ozone depletion, acidification, eutrophication, human and ecological health, smog formation, etc., but came up with divergent conclusions, possibly due to different approaches in scoping. These LCAs typically report that bio-ethanol results in reductions in resource use and global warming; however, impacts on acidification, human toxicity and ecological toxicity, occurring

mainly during the growing and processing of biomass, were more often unfavorable than favorable. It is in this area that further work is needed.

MIGUEL J. DABDOUB, Ph.D.

President of the Biofuels Chamber of the São Paulo Government, and professor at the University of Sao Paulo, Brazil

Dr. Dabdoub obtained his PhD in Organic Chemistry in 1989, and he is currently Associate Professor and the leader of LADETEL - Laboratory for Clean Technology Development at the University of São Paulo, Ribeirão Preto campus. Presently, Dr. Dabdoub is responsible for the Biodiesel Brasil Program which is developed in partnership with 28 different private companies, and 5 other Brazilian universities. He is also President of the Biofuels Chamber of the São Paulo State Government. Dr. Dabdoub is the head of the Program for Testing Biodiesel on Vehicles and Engines, coordinated by the Brazilian Federal Government, with the participation of several companies such as Ford, Volkswagen, Fiat, Mercedes Benz, Peugeot, Citroen, Valmet (tractors), Cartepillar, Bosch, Siemens, Delphi, Cummins, MWM-International Engines, Parker Filters, Mahle, Mann, Fleetguard filters and others. Dr. Dabdoub is working in collaboration with Brazilian, European and American companies building biodiesel plants. Mr. Dabdoub has previously built a biodiesel plant in Brazil and the United States.

ABSTRACT: Biodiesel: Brazilian and South American Current State and Perspectives. New and Future Feedstocks for its Production

The brazilian sugar-cane based ethanol production model is based on a highly integrated production system where each one of the “undesired by-products” in the past, were transformed into a high value contribution by means “new products” affording economic and energy efficiency to the complete production chain. The result is that now, ethanol prices are 2.5 times cheaper than gasoline prices, to the consumer, and that by 2010 Brazil will consume higher volumes of ethanol related to gasoline in the whole brazilian energy market. Similar and additional indirect benefits can be expected from the international carbon policy that can contribute to make bioelectricity produced from sugar-cane-bagasse more competitive, making ethanol prices even more attractive. Brazilians understand that the biggest challenge for the Biofuels success production (in particular for biodiesel production) and for the international trade of it, as a commodity, will be, first: a large scale Feedstock sustainable production to guarantee lower and competitive prices in the future, second: to have the biggest possible number of countries using and producing Biofuels, and finally: to answer the Biofuels detractors questions, proving that it is possible to have positive results on the integrated food and energy production, eliminating paradigms based on the discussions about Food security Vs. Energy security. In this way, Brazil is designing its own biodiesel model based on sustainability, considering a future, more integrated production system, based not just on soybean production but on the agro-energy forests that allow to preserve the local and part of the global biodiversity taking advantages of the agro-diversity, contributing on the carbon sequestration - BCF (as trees are grown) and green

house gases emissions reduction – PCF (as Biofuels allow an increasing substitution of fossil fuels).

For the Brazilian government, biodiesel production and it's introduction into the Brazilian energy market is of the highest priority and is of tremendous national interest. Brazil is the primary world producer of sugar-cane ethanol, and employing this ethanol as a starting material, the country will be able to produce a 100% truly renewable biodiesel, in contrast with the biodiesel made with methanol produced in Europe and the USA. Consequently, the Brazilian trend will be to produce ethyl esters, although most of the Brazilian biodiesel produced presently is still soybean methylic biodiesel. Taking advantage of the abundant availability of a huge variety of vegetable oil feedstock (seeds and fruits) such as the various Latin American and African palms, soybeans, sunflowers, peanuts, and other Brazilian plants and trees, our research group has devoted their efforts of the past ten years researching the ethanolysis of at least twenty different vegetable oils. Our results concerning the production and use of ethylic biodiesel, clearly show that this method is technically feasible to employ industrially. During our presentation about the development of biodiesel in Brazil, we will elaborate on the production capacities, current demand, and the outlook for the future of biodiesel. Details on improving technology for production, and, in particular, on the employment of ethylic biodiesel in a variety of engines will also be disclosed in the discourse.

THOMAS H. DELUCA, Ph.D.

Senior Forest Ecologist, The Wilderness Society

Dr. Thomas H. DeLuca is a Senior Forest Ecologist with The Wilderness Society, a non-government organization dedicated to the preservation of wild and natural landscapes. Prior to joining the Wilderness Society, Dr. DeLuca was a Professor of Forest Soils at the University of Montana and remains an Adjunct Professor at the University. Dr. DeLuca also serves as a guest professor in the Department of Forest Ecology and Management at the Swedish University of Agricultural Sciences in Umeå Sweden and is an affiliate professor in the Department of Land Resources and Environmental Sciences at Montana State University. Dr. DeLuca holds a PhD in Soil Microbiology and Biochemistry from Iowa State University, an MS in Soils from Montana State University, and a BS in Natural Science from the University of Wisconsin - Madison.

Over the course of his scientific career, Dr. DeLuca has studied how natural and anthropogenic disturbance influence C, N, and P cycling in forest, prairie and tundra ecosystems. Areas of emphasis include sustainability of soil resources as influenced by land management, fire ecology, forest biogeochemistry, forest restoration, and ecological benefits and limitations of biofuel development. Dr. DeLuca is the author of over 60 publications in refereed journals and numerous non-refereed reports and articles. He is an elected officer in the American Association for the Advancement of Science, and is an active member of the Soil Science Society of America, the Ecological Society of America, and the Union of Concerned Scientists.

ABSTRACT: Ecological Concerns of Forest Biomass Based Cellulosic Ethanol Production

Cellulosic ethanol production has been identified by the Bush administration as one of the primary mechanisms by which gasoline consumption might be reduced in the US. Unfortunately, large scale ethanol production comes with environmental costs and logistical limitations (DeLuca, 2007) that are greatly being overlooked. There are no commercial cellulosic plants currently on line which greatly limits the assessment of the environmental and logistical short comings of large scale development of this technology.

Current estimates suggest that by 2020 we should be capable of producing some 20 – 25 billion gallons of cellulosic ethanol annually. Ethanol takes on water if shipped by pipeline, thereby reducing the distance that this material can be economically shipped and creating a need for locally sited ethanol stills. Since the Midwest will be producing most of the grain ethanol in the US, much of the cellulosic ethanol would likely come from the southeast and west. Several feedstocks (biomass from which cellulosic ethanol is formed) have been identified for cellulosic ethanol including woody biomass from fuel reduction and forest restoration treatments. The following summarizes some logistical and environmental concerns that must be addressed prior to large scale development of cellulosic ethanol:

- Cellulosic ethanol production requires a lot of land. The production of 25 billion gallons of ethanol requires approximately 305 million tons of biomass annually. Sustainable rates of biomass removal from fuel reduction and restoration treatments have been estimated at 60 million tons of biomass annually for public and private lands nationwide (Perlack et al. 2005). If all of this biomass originated from thinning operations in the Rocky Mountain West (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming), then about 6 million acres of land would be thinned in this region annually, reflecting a 15 fold increase in thinning activities this region.

- Biomass can only be hauled about 50 miles. Forest biomass, especially 'small trees and underbrush' represent a bulky, low density feedstock making transportation and storage a significant logistical problem. One ton of chipped woody biomass is equivalent to about 4 cubic yards volume. Right now break-even hauling distances are estimated at about 50 miles, thus creating intense local demand on forest resources. One midsized ethanol plant producing 20 million gallons of ethanol per year would require about 670 tons of biomass per day or about 244,000 tons of biomass each year. Each year, about 1 million cubic yards (one football field piled over a mile high) would be delivered to this site by over 8,000 individual truck loads. At 50 miles per delivery, this will require 400,000 transit miles for one ethanol plant each year and approximately 400 million to 500 million transit miles nation wide per year just for biomass delivery.
- Cellulosic ethanol production may create a strain on local resources. Seeley Lake is an example of a heavily wooded area in Western Montana. Within a 50 mile radius of Seeley Lake there are about 1.2 million acres of private and public forest that are potentially available for timber harvest. About 40% of land area is suitable for mechanical thinning and fuel reduction harvests, thus if a 30 year rotation is used, then the plant could produce less

than 8 million gallons of cellulosic ethanol annually. Ethanol plant design capacity must take forest resource limitations into consideration.

- Forest biomass removals may damage the forest land base. Ground-based thinning equipment disturbs soil, encourages invasive species, and alters habitat. Mechanical timber harvest equipment compacts and exposes surface soils thereby decreasing site productivity. Forest restoration and fuel reduction operations increase weed pressure and decrease surface organic soil horizons. Harvesting on a 30year return interval should minimize cumulative impacts; however, long-term effects should be monitored.
- Ethanol production requires a lot of water and degrades water quality. Each gallon of ethanol produced consumes (water driven off as vapor) about 4 gallons of water (currently estimated at closer to 6 gallons for cellulosic ethanol), therefore a 20 million gallon per year ethanol plant will consume at least 80 million gallons of water annually. In dry western states, this may be a significant impediment. Water is also chemically and thermally altered within ethanol plants and must be treated prior to return to natural water bodies. Removal of 10 tons of biomass per acre results in the removal of approximately 10,000 lbs of carbon, 60 lbs of nitrogen, and 5 pounds of phosphorus per acre. A 20 million gallon per year plant would result in the annual removal of 1.4 million pounds of N and about 120,000 pounds of P from surrounding forests and then concentrate these nutrients in the waste water stream.

Cellulosic ethanol represents a renewable resource and a significant reduction in greenhouse gas emissions when compared with petroleum. However, safeguards must be made to avoid environment degradation and inappropriate biomass demands in the production of a transportation fuel. First and foremost, we need to pursue meaningful improvements in fuel efficiency, aggressively promote fuel conservation, and develop alternative transportation systems. Such efforts will reduce our overall demand for transportation fuels, dramatically reduce carbon emissions, and reduce the pressure to produce ethanol from crop and forest resources at a rate in excess of the capacity of land to deliver.

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ROBERTO DOBLES, Ph.D.

Minister of Environment & Energy of Costa Rica; President of the Administration Council Bureau at UNEP 2007-2009; President of the Ministerial Global Environmental Forum 2007.

Dr. Dobles earned his Doctorate in Management Administration from the *Université of Paris, France.* Also has a Master in Business Administration (MBA), University of Louvain, Belgium and a Master in Industrial and Systems Engineering (MSc), University of California (UCLA), USA. He also has a Bachelor of Science (BS) in Industrial and Systems Engineering.

Currently Dr. Dobles is the Minister of Environment and Energy in Costa Rica, also in charge of Environment, Energy, Water Resources, Mining and Telecommunications. He has vast international experience including President of the Governing Council Bureau at United Nations of Environment Program 2007-2009, President of the Ministerial Global Environmental Forum 2007 and was the Pro Tempore President of the Central American Commission of Environment and Development (CCAD) II Semester 2006.

In Costa Rica, Dr. Dobles has been the Chairman and CEO of the National Institute of Electricity (ICE), the President of the Administration Council of the National Company of Light and Power (CNFL), Minister of Science and Technology, and Chairman and CEO of the National Refinery Company (RECOPE). Over the years, he has been an international consultant and diplomat, has been part of executive and directive boards across multiple sectors including commerce, energy, technology, mining, and free trade zones.

ALEX FARRELL , Ph.D.

Associate Professor University of California-Berkeley, and U.S. representative to the Steering Board of the Roundtable on Sustainable Biofuels.

Alex Farrell is an Associate Professor in the Energy and Resources Group at the University of California at Berkeley and is director of the UC Berkeley Transportation Sustainability Research Center. Alex received his Ph.D. in Energy Management and Policy from the University of Pennsylvania and then worked as a research fellow at Harvard, and as a research engineer at Carnegie Mellon University, where he remains part of the Climate Decision Making Center. For the last decade Alex has conducted research on energy and environmental policy and has published over two dozen peer-reviewed papers on these topics. Alex was co-director of two recent studies: *Managing Greenhouse Gases In California,* and *A Low Carbon Fuel Standard for California.* Alex has served on advisory committees for the National Academy of Engineering, the National Science Foundation, and has consulted for various public and private organizations including the International Roundtable on Sustainable Biofuels.

JASON HILL, Ph.D.

Research Associate in the Department of Applied Economics and the Department of Ecology, Evolution, and Behavior at the University of Minnesota.

Dr. Hill is a research associate in the Department of Applied Economics and the Department of Ecology, Evolution, and Behavior at the University of Minnesota. There he is part of an interdisciplinary team conducting integrative analyses of the technological, environmental, economic, and social aspects of sustainable bioenergy production from current and next-generation feedstocks such as diverse prairie biomass. Previously, he was an assistant professor of biology at St. Olaf College. Hill received his A.B. in biology from Harvard College and his Ph.D. in plant biological sciences from the University of Minnesota.

ABSTRACT: Understanding the climate change consequences of an expanding transportation biofuel industry

Recent life cycle analyses have consistently concluded that corn ethanol as it is currently produced releases on average approximately one-sixth less greenhouse gases than gasoline. While these results have been shown to be robust under conditions of small scale production, such studies are bound by a host of assumptions that are unlikely to hold in an expanding industry where increased production affects agricultural practices, land use, and food and energy markets. Improving current models to reflect these effects requires greater consideration of the consequences of converting land from native ecosystems to agricultural production, of displacing domestic agricultural production to foreign nations, of modifying the existing dominant crop rotations, and of elasticity in energy markets. As a whole, such effects tend to reduce the net greenhouse gas emission advantage of corn ethanol over gasoline. Consequently, biofuels from non-food feedstock sources such as lignocellulosic crops and waste may have even greater greenhouse gas benefits over corn ethanol than currently thought, especially if they are produced on degraded or marginal land so as not to compete with existing crop production. More thorough understanding of these effects is essential as biofuels are increasingly being considered as vital parts of climate change mitigation strategies, which must also must contend with reality of a growing and increasingly affluent world population.

MARCIA PATTON-MALLORY, PhD

Biomass and Bioenergy Coordinator, USDA Forest Service, Office of the Chief

Dr. Patton-Mallory is responsible for coordinating the woody biomass efforts of the USDA Forest Service across National Forest System, State and Private Forestry, and Research and Development programs. The position provides executive liaison and coordination between the USDA Forest Service and other Federal Agencies, State organizations and private interests. She

has twenty-five years of Forest Service experience as: Station Director and Assistant Station Director of the Rocky Mountain Research Station, Fort Collins, CO; Staff Specialist in Forest Products and Harvesting Research, Washington, DC; and Research Engineer, Forest Products Laboratory, Madison, WI. Additional relevant experience includes Science and Technology Fellow in the U.S. Senate working on energy and natural resources issues, and internships with Weyerhaeuser Company, Tacoma, WA.

Dr. Patton-Mallory has a Master of Sciences and a PhD in Civil Engineering, Structural Engineering and Solid Mechanics from Colorado State University. Currently she is part of the Western Governor's Biomass Task Force for Clean and Diversified Energy for the West; Western Forestry Leadership Coalition - Hazardous Fuels and Forest Health efforts; USDA Energy Policy Council; Interagency Woody Biomass Utilization Group and leadership in developing the U.S. Forest Service Woody Biomass Utilization Strategy.

ABSTRACT: Bioenergy and Sustainability of Forests in the USA

One of the greatest challenges facing forest managers in the United States on both public and private land is restoring, maintaining and enhancing the health and resilience of forest ecosystems. In many forests, this requires the removal of large quantities of small-diameter and low quality material that currently has little or no commercial value. Furthermore, climate change is likely to exacerbate the forest health problem in many parts of the country. A warmer climate could increase the risk of uncharacteristic and destructive wildfires and increase the susceptibility of forests to large-scale insect and disease epidemics. Climate change increases both the magnitude of the effort needed and the urgency of taking action.

Increasing the utilization of woody biomass from forests through hazardous fuel reduction, forest restoration, and other vegetation management activities on public and private lands can help offset the costs of these activities, provide economic opportunities to rural communities, and enhance environmental benefits for the American public. When the woody biomass is converted to energy and energy products, there are the additional benefits of air pollution offsets, renewable energy and associated displacement of fossil fuels.

Utilization of woody biomass is most successful when local needs and interests are matched with the local forest resource issue. Local forest resource issues generating biomass can be the result of forest fuels reduction, major insect outbreaks, significant storm damage, treatments for invasive species, and general forest health restoration activities. Communities benefit by increased rural jobs, new industry, renewable energy for schools and administrative facilities, alternative to landfills for urban forest management, and diversification of their economic base.

The use of wood-based energy lowers greenhouse gas emissions over fossil fuels, because carbon dioxide released when woody biomass is burned is balanced out by new, carbon-sequestering biomass growing in its place. For this reason, developing renewable systems such as growing trees for energy crops on private lands has gained considerable attention and support.

Maintaining healthy working forests and utilizing by-products of forest management actions allows both sequestration and biofuels production to occur on the same acres.

National, State and local activities in different regions of the United States are presented along with a summary of the public dialog about energy from woody biomass and sustainability of forests.

Selected References:

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GAO PRONOVE

Executive Director of Earth Council Geneva and the Managing Director of the GHG Management Institute

Gao Pronove is the Executive Director of Earth Council Geneva and the Managing Director of the GHG Management Institute, both NGOs offer training on climate change, biodiversity, global trade and sustainability. Gao worked for 10 years with UNITAR, UNFCCC and UNCTAD managing climate change capacity building programs. He is a principal of Eco Market Farms, a cassava-ethanol project in the Philippines. He is also a member of the Steering Committee of the Minnesota Terrestrial Carbon Sequestration Initiative.

LOIS QUAM

Managing Director of Alternative Investments at Piper Jaffray Companies

Lois Quam is managing director of Alternative Investments at Piper Jaffray, a newly created senior post responsible for development of new business opportunities in the alternative energy/clean technology and health care sectors. Quam will manage investment offerings in two areas of social interest and growth potential around climate change and health. She will build on

the established record that Piper Jaffray has in health care and emerging prominence in alternative energy and clean technology.

Known as one of the most successful businesswomen of her generation, Quam was one of the executives who built UnitedHealth Group. She is known for developing effective businesses characterized by collaboration between government and companies; working in arenas where science and producer and consumer incentives are prominent; and identifying and executing on high-growth businesses. Quam created and operated a $30 billon business at UnitedHealth Group focused on improving health care for older Americans and low income families. She has appeared three times on Fortune's list of the "Most Powerful Women in America."

Quam has been active in public service including serving as chair of the Minnesota Health Care Access Commission, and as senior advisor to the President's Health Care Reform Task Force in 1993. A native of southwest Minnesota, Quam was named Norwegian American of the Year in 2005. She is a graduate of Macalester College and received her master's degree at Oxford University as a Rhodes Scholar.

SHRI RAMASWAMY, Ph.D.

Professor and Head of the Department of Bioproducts and Biosystems Engineering at the University of Minnesota

Dr. Ramaswamy is professor and head of the Department of Bioproducts and Biosystems Engineering at the University of Minnesota; he is also a graduate faculty in the Department of Mechanical Engineering. He has degrees in paper science and engineering and chemical engineering and over nine years of experience in forest products industry in various areas including process engineering, process research and development, and chemical applications technology development.

In addition to teaching unit operations of bio-based products manufacturing, Dr. Ramaswamy is very active in conducting research in topics related to transport through porous media, structure-property relationships, bio-based polymers properties and performance and integrated biorefining. Dr. Ramaswamy is a member of the Technical Association of Pulp and Paper Industry (TAPPI), Paper Industry Management Association (PIMA) and American Institute of Chemical Engineers (AICHE).

ABSTRACT: Biofuels – Today and Tomorrow

There is an increasing interest in biofuels and bioenergy due to the rise in petroleum costs, the need for reducing greenhouse gas emissions, and the motivation to reduce our dependence on foreign oil. Potential petroleum demand/supply imbalances pose a significant challenge for the people and economies of all regions, but particularly those regions such as the Americas that do not have significant petroleum or other fossil fuel reserves. Regions of the Americas rich in

biomass such as Minnesota have a substantial opportunity to ensure future energy supplies while enhancing economic growth.

The key to expanding the energy supply, increasing energy security and reducing the dependency on foreign-oil is to develop advanced technologies to efficiently transform our renewable bio-resources into domestically produced bioenergy and bioproducts. Current technology provides a number of options for conversion of biomass and other biomaterials to fuels and energy. The options available include direct firing for steam for large-scale district heating and electricity generation, production of ethanol and bio-diesel. Transportation fuels (gasoline, diesel, jet fuel) account for the greatest quantity of energy consumed in much of the world, followed by coal and natural gas used primarily for electrical generation and home heating.

In Minnesota, in 2005, renewables accounted for about 86 trillion Btu of total state energy production, or about 7.1 percent of total energy consumption and in 2006 renewable energy production included about 11 percent of electricity, 10 percent of gasoline, and 2 percent of diesel. The state currently ranks 4th in production of wind energy, 4th in production of ethanol, and 8th in production of biodiesel.

While corn and sugar cane are today by far the leading raw material for biofuels (ethanol) production in Minnesota and in Brazil respectively, emerging technology is likely to expand biofuels options to include energy crops such as switch grass, agricultural crop residues, and broader applications of forest-biomass. It has been shown that biofuels from cellulosic biomass have the potential to decrease the fossil fuel inputs as well as green house gas emission reduction, both of significant importance as we move towards a sustainable bioeconomy. In addition to biofuels, such feed stocks will also become important as a source of other materials and chemicals to meet the growing societal demands. Increasing importance of biomass as a source of energy and products translates to substantial opportunity for agriculture and forest sector being able to expand product options, diversification, and increased profit potential. In the near future, integrated biorefineries based on conventional forest and agricultural industries with multiple products and co-products including energy and fuels could become important biorefineries due to its current capital infrastructure for converting renewable resources on a sustainable basis and help increase the revenue and products streams to improve their profitability. This general integrated approach will play an increasingly important role in the design and development of the future fully integrated lignocellulosic biorefinery of the 21st century bioeconomy.

C. FORD RUNGE, Ph.D.

Director of the Center for International Food and Agricultural Policy, and Distinguished McKnight University Professor of Applied Economics and Law, University of Minnesota

C. Ford Runge is a Professor of Applied Economics and Law at the University of Minnesota, where he also holds appointments in the Hubert H. Humphrey Institute of Public Affairs and the Department of Forest Resources. His teaching and writing interests concentrate on trade and natural resources policy. Professor Runge received his Ph.D. in agricultural economics at the

University of Wisconsin, his M.A. in economics as a Rhodes Scholar at Oxford University, and his B.A. at University of North Carolina-Chapel Hill. He has served on the staff of the House Committee on Agriculture, and as a Science and Diplomacy Fellow of the American Association for the Advancement of Science, working U.S. AID on food aid and trade. He continues as Subdirector in charge of Commodities and Trade Policy of the Center for International Food and Agricultural Policy at the University of Minnesota.

DAVID P. SWANSON

Partner at Dorsey & Whitney LLP, and Chair of the Agribusiness, Cooperative and Rural Electric Practice Group

David P. Swanson is a partner at Dorsey & Whitney LLP. He is Chair of the Agribusiness, Cooperative and Rural Electric Practice Group and Co-Chair of the Project Development and Finance Practice Group, specializing in business combinations, project development and corporate finance. He has been involved in a wide variety of financing transactions including mergers and acquisitions, tax-exempt financings, single-investor and leveraged lease financing transactions for capital equipment and generating facilities, corporate private placements and public debt offerings, institutional lines of credit, and bank loans secured by real property, personal property, and other corporate assets.

He has been extensively involved with lenders, borrowers, and other participants in various energy transactions, and as a result of his broad-based experience with in a variety of transactions, he understands the needs and practices of all parties to a transaction and is particularly adept at closing structurally and legally complex transactions under real-world exigencies.

Mr. Swanson is a 1978 graduate of St. Cloud University (B.S., chemistry) and a 1981 graduate of the Vanderbilt University School of Law, in Nashville, Tennessee, in the top 15 percent of the class. After graduation from law school, he worked for nearly two years at Chapman and Cutler, a large Chicago law firm, specializing in tax-exempt financing transactions and, in particular, industrial development and pollution control financing.

ABSTRACT: Policy considerations for the next phase of biofuels industry development

Despite well publicized claims that the ethanol boom has ended, it seems clear ethanol has a very bright future. It seems equally clear that the potential demand for ethanol will not be satisfied by production of ethanol from corn. Cellulose and other alternative feedstocks for ethanol production will almost certainly need to be developed to meet the potential demand.

A history of the development of the ethanol from corn industry in the Midwestern United States in the past twenty years is instructive to policy makers and industry participants as they make decisions about the future growth of the ethanol industry. I plan to review several aspects of the development of ethanol production over the past two decades, focusing on some of the lessons that may be learned by policy makers and industry participants as the biofuels production continues to develop.

Ethanol development began in the late 1980s and continued through the 1990s as an economic development undertaking in agricultural regions. It was viewed as an activity that would help farmers as well as the communities where farmers live, buy inputs and sell agricultural products. In the early part of this development period, the major capital markets and investment communities were very reluctant to participate in this industry in large part because it was very uncertain whether markets for ethanol would develop. Capital markets continued to be hesitant to invest even after ethanol markets began to form and mature, and even after Federal policy promoted ethanol as a fuel additive, assuring ethanol markets would exist. This reluctance was driven primarily by the economic uncertainties associated with the commodity nature of both the products of an ethanol manufacturing plant (ethanol as well as DGs), and the major inputs into manufacturing (corn and natural gas).

This reluctance changed dramatically in 2005, about the time Hurricane Katrina devastated the Gulf Coast and New Orleans, and ethanol began to look like an economically attractive alternative to refining foreign petroleum. Our equity capital markets reacted with enthusiasm and unrealistic expectations. Ownership of ethanol production began to shift from strategic oriented investors—farmers, rural business owners and agricultural businesses—to private equity firms and publicly traded companies. These investors seem to lack the patience needed to allow ethanol production—which is still very much a developing industry—to develop in a disciplined way. These investors appear to have become disillusioned with ethanol, primarily because this industry seems unlikely to be able to sustain large growth and profits consistently over extended periods of time.

Unquestionably, State and Federal policies—and economic incentives—played a very significant role in the development of ethanol production over the last two decades. State subsidies and Federal tax incentives were important (and sometimes critical) factors in the economic feasibility analysis. These policies were focused primarily on creating markets for ethanol and creating incentives to construct production facilities. But these policies did not create significant incentives for strategic investment and long-term decision making regarding ethanol production.

In today's environment, Federal and State policies should focus on a more complex set of factors and circumstances. Policy should emphasize the need for alternative feedstocks for biofuels, and in particular the infrastructure necessary to move alternative feedstocks into production facilities and the biofuels into markets. Policy should encourage private and public coordination in efforts to develop economical and environmentally sound production methods. Policy should also

create incentives for strategic investment in biofuels production; strategic investment is more likely to cause the biofuels industry to grow in a disciplined way. Policy should also create incentives to consider global climate impact in production of biofuels.

FRANZ TATTENBACH, Ph.D.

Executive director of FUNDECOR, and elected member of the first Executive Board of the Clean Development Mechanism of the Kyoto Protocol, and former ambassador and lead negotiator for Costa Rica

Dr. Tattenbach, B.S., M.A., Ph.D. abd, (Cornell University), is Costa Rican economist. Currently he is executive director of FUNDECOR (1993-to date), a leading environmental NGO winner of the 2000 King Baudouin International Development Prize for its pioneer work in integrating the benefits of the local communities to the national and international interests to conserve tropical forest by means of FSC group certification and developing the forest environmental services markets for which Costa Rica is world renown. Within the framework of the United Nations Climate Change Convention, he was elected to occupy one of the two chairs designated by the non-Annex I parties to the first 10-member Executive Board of the Clean Development Mechanism of the Kyoto Protocol, where he also served as its Vice-Chair (2001-2003). Former ambassador and lead negotiator for Costa Rica in the climate change multilateral negotiations (1997-2003); and head of the Costa Rican Office for Joint Implementation (1995-2001); he also currently serves on the Board of Directors of the High Technology Center Foundation, together with the Deans of Costa Rica's four State Universities (2000-to date) and on INCAE's International Center for Sustainable Markets (CIMS) (2003-to date). Former member of the Board of Directors of the National Regulatory Authority of Public Services (1997-1998). Former Director of consulting services at Price Waterhouse, Costa Rica (1989-1993) and private consultant to multilateral institutions and the private sector in the design and economic analysis of large development and investment projects.

ALBERTO TREJOS, Ph.D.

Professor at INCAE Business School and former Minister of Foreign Trade, Costa Rica.

Alberto Trejos is a Costa Rican economist who is an active researcher in macroeconomics, international trade and development economics. A National Science Foundation grantee and Fulbright scholar, Trejos has worked as a professor at INCAE, Latin America's leading business school, since 1997. He has previously held positions as dean of INCAE and general director of its American Center for Competitiveness and Sustainable Development. Trejos is also a former professor at Northwestern University. More recently, he served as Minister of Foreign Trade of

Costa Rica from 2002-2004 and was responsible for Costa Rica's ratification of its FTA with Canada.

Trejos received his Ph.D. from the University of Pennsylvania, and serves as president of CINDE (Costa Rican Investment Board) and as a consultant for several companies and international organizations.

CONSTANZA VALDES

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Lead analyst for Brazil's economy, policies and agricultural markets. Project manager of the Brazil Emerging Markets Program to analyze and assess the competitiveness of Brazil in global markets. Previously detailed for three years to the Latin American Economic Systems (SELA) Permanent Secretariat, a regional economic research organization headquartered in Venezuela. Extensive experience conducting analysis and research on economic, agricultural and trade policy issues, especially with respect to economic analysis of the North American Free Trade Agreement (NAFTA), regional integration in the Western Hemisphere, and analysis of food systems in the Asia Pacific region. Responsible for a joint ERS/SELA/UNCTAD/World Bank project to examine and analyze the implementation of agriculture-related commitments undertaken by Latin American countries. Detailed for two years to the Pacific Economic Cooperation Council (PECC) International Secretariat in Singapore as the U.S. Director of the Pacific Food Outlook 1997-98, the first region-wide report to provide a short-term outlook of the Pacific food system. Before joining the PECC Secretariat, held the position of Co-leader of ERS's Western Hemisphere Integration and Trade Analysis research program to analyze the impact of Western Hemisphere economic integration on U.S. agricultural trade. During NAFTA negotiations, was ERS's Mexico analyst, providing considerable policy support for the negotiations. Author and co-author of numerous research reports related to analysis on Latin American and Asia-Pacific agriculture, and of scenarios analyses, policy updates, information bulletins, technical reports, situation and outlook report articles, briefings and speeches presented to the academic community, trade associations and international and regional organizations.

ABSTRACT: Biofuels in the Americas: Markets, Policies and Prospects

Rising crude oil prices, paired with a growing domestic and global demand for renewable sources of energy for the transport sector are driving developments in the biofuels sector in the Americas, and around the world. The Americas, mostly the United States and Brazil, account for 70 percent of the world's biofuel -Brazil alone already produces 40 percent of the world's biofuels- whereas the U.S., the EU-27, China, and India produce much of the balance. Brazil uses sugarcane to produce its ethanol, while U.S. producers rely most heavily on corn, and the EU-27 mainly produces biodiesel from rapeseed and other vegetable oils. China and India use mostly sugar, although China also extracts fuel from rice and wheat (IEA, 2006).

Global biofuel production has tripled since 2000, reaching 15.5 billion gallons in 2006 (F.O. Licht, May 2007). Biofuels currently meet just over 1 percent of road-fuel demand worldwide,

but the long-term prospects are for biofuels to play a much larger role in meeting world road-transport fuel demand –the IEA forecast this share to quadruple by 2030. In the United States, biofuels currently account for roughly 3 percent of overall transportation fuel use (ERS/USDA), compared with 15 percent in Brazil.

Several of the countries in the Americas are looking at Brazil's experience in the biofuel sector, including fuel alcohol and biodiesel production and use-end, and at Brazil's past and present policies as guidance for biofuel developments in their own countries. The large role that Brazil plays in global biofuels markets owes to decades of public and private investment in agroenergy development, the country's large sugarcane production, and government incentives for ethanol production. Brazil is a pioneer in the use of ethanol in road-transport since the early 1970s, and many developed and developing countries in the world are seeking to replicate Brazil's ethanol experience to develop more environmentally benign energy. Biodiesel production and use, however is in the infant stages with only a few plants now generating biodiesel fuels from soybeans, sunflowers, palm trees and castor beans.

The America's agroenergy potential over the next two decades will be influenced both by external factors (i.e, international prices of feedstock supplies, foreign demand for renewable fuel, trade agreements) and domestic production policies: blending targets, credit availability for biofuel production at subsidized interest rates, tax exemptions that favor production of feedstocks and/or processing of biofuels, and social policies that may impact the cost structure and profitability of biofuels, among others. Various other factors may impact the competitiveness of the region's biofuels sector, such as transportation and storage logistics and the government policies to attract and/or retain international investments. The Americas efforts to create biofuels markets will also be affected by the various bilateral, regional and multilateral trade agreements, in which these countries may participate.

WILLIAM A. WARD, Ph.D.

Director of the Center for International Trade, and Professor of Applied Economics and Statistics at Clemson University

Dr. Ward has served as Director of the Center for International Trade at Clemson University since its start-up in May 2000. Since 1990, he has been Professor in the Department of Applied Economics and Statistics and in the cross-disciplinary faculties of Policy Studies, and Economic Development. He is the co-author of the new World Bank report "Considering Trade Policies for Liquid Biofuels". He started his professional career in 1970 as an economist in the Young Professionals Program at the World Bank, where he served for seven years in a number of different capacities. From 1980 to 1990, he was President of the Institute for Development Programs, an international development technical assistance organization based in McLean, Virginia.

Professor Ward's 1991 book *The Economics of Project Analysis* was the World Bank's best-selling title for the decade of the 1990s, was translated by the Bank into five languages, and for

ten years was the basis for World Bank training programs on project economics in all the Bank's member countries. In 2005 he resumed work with former World Bank colleagues on applications to biofuel economics of the trade policy approach to cost-benefit analysis (a.k.a., Little-Mirrlees method), and on applications of New Institutional Economics concepts to the analysis of energy efficiency financing programs in developing and emerging market economies. A book on the latter subject, co-authored with Robert P. Taylor and colleagues at the World Bank, is due out in December.

Bill Ward is a native South Carolinian. He received the BA degree from Clemson University in 1965 and the MS degree in 1967, before earning the Ph. D. degree from Michigan State University in 1972.

ABSTRACT: Policy Distortions, and Biofuel Investment and Program Analysis

Liquid biofuels for transport look to be the most policy-distorted major products in the global economy by 2010. It is already difficult to analyze biofuel investments and policies in real, economic terms.

Four developments are the primary supporters of biofuel policy/price distortions:

- Political statements in a number of countries touting domestic production of biofuels as a path to energy independence (often interpreted as self-sufficiency)
- Developed-country farm lobby interest in biofuels as major new markets
- Hope across a range of countries that biofuels will lead to rural employment and economic development
- Arguments favoring biofuels as solutions to a number of environmental problems, including climate change

Already-serious ethanol and biodiesel policy distortions will worsen without good, readably-reported research. The research is falling behind the hype that drives biofuel policies. Meanwhile, agricultural policy already plagues international trade negotiations. And while the WTO has classified biodiesel as an industrial product, ethanol is considered an agricultural product, allowing trade policy distortions not tolerated for industrial products. Meanwhile, feedstock (maize, sugarcane, soy beans, palm oil, etc.) represents more than half the cost of producing first-generation biofuels. Thus, agricultural policies directly affect costs and prices of biofuels. Second-generation technologies could break this link to agricultural policies, but only if new distortions are not put into place on them. (U.S. biofuel subsidies already grant a weight of 2.5 to these non-food feedstocks compared to first generation feedstocks.)

Support policies for ethanol and biodiesel surveyed in this presentation fall into two categories: (1) policies to replace consumption of petroleum fuels through mandating of biofuel use and reductions in fuel taxes for biofuel; and (2) policies to stimulate biofuel production domestically through producer subsidies, import tariffs to protect local producers and direct government support for local production, and research to develop new or improved technologies.

Suggestions for further reading: "A slew of new reports on biofuel subsidies: Evaluating U.S. and EU policies", posted by Ron Steenblik at 2:17 PM on 10 Oct 2007. At http://gristmill.grist.org/story/2007/10/10/112525/55

LUCA ZULLO, Ph.D.

Technical Director of Cargill Environmental Finance

Dr. Zullo is the Technical Director of Cargill Environmental Finance, a new unit of Cargill tasked with the development of renewable energy and emission reduction projects worldwide. Environmental Finance operates principally but not exclusively in the ag and food processing sector. Prior to joining Environmental Finance, he was involved in biofuels and bioenergy activities at Cargill corporate R&D group. He holds a Chemical Engineering Degree from the University of Padova, Italy and a Ph.D. also in Chemical Engineering from Imperial College of Science, Technology and Medicine in London, United Kingdom. Before joining Cargill, he held positions at Shell Research in The Netherlands and Cray Research.