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Trends And Insights

[Choosing the Right Fuel Sources Will Affect the Future of Biofuels](#)

By [IAF Futurist Craig Bettles](#)

As the price of gasoline at the pump has skyrocketed, a wave of investment has swept over the biofuels sector. Venture capital investment in biofuels increased more than sixty-fold last year with the majority of that investment going for the technology and infrastructure needed for corn-based ethanol. Politicians from both parties have jumped on this rare bi-partisan issue to loudly announce their support. Ethanol now uses around [20 percent](#) of the nation's corn harvest compared to 6 percent only seven years ago.

Right now politicians and businessmen are making decisions that will affect the biofuels industry for at least the next decade. They are making choices that will favor corn-based ethanol and could lock us into corn-based ethanol as a major source of transportation fuel. However, by making smart choices now, we can create a better and more sustainable future by fast tracking development of alternatives to corn-based ethanol.

The use of food crops creates a win-lose scenario for the future. The use of sugar for ethanol has helped Brazil become energy independent. Soaring prices for corn have helped to revitalize rural towns in the U.S. left behind in the last technology dominated business cycle. Farmers from the mid-west to the hinterlands of Brazil have responded enthusiastically to high prices by switching fields to corn and opening up new areas to farm.

But there have also been losers in the ethanol boom. The use of corn for ethanol in the U.S. has caused widespread price inflation in foods from tortillas to hops for beer. The [tortilla riots](#) in Mexico earlier this year are linked to the high prices of corn. New ethanol plants and water for agriculture are straining municipal [water supplies](#), and [toxic emissions](#) from ethanol plants

are larger than first believed. Sugar and soy production in Brazil for biofuels is also pushing farmers [further into the rainforest](#).

There have also been questions about the net energy gained from corn-based ethanol. Cornell ecologist David Pimentel and Berkley engineering professor Tad Patzek believe that corn-based ethanol [consumes 29% more energy](#) to produce than it creates. Other studies have shown a much more positive [29% to 65% return on energy invested](#).

It will take a shift to more efficient and dedicated fuel crops to create a sustainable future. Switchgrass and miscanthus, two fast growing grasses, can produce two to three times more gallons of ethanol per acre than corn. More research is needed to improve the conversion efficiency and the cost per ton of ethanol for these fuel stocks - but both look like strong contributors to our fuel mix over the next few years.

Algae is another dedicated fuel crop with tremendous potential. Small scale experiments have been very promising. Current experimental yields from algae range from 819 gallons of biodiesel per acre with a high end estimate of 5,000 gallons per acre. This is a huge increase compared to 48 gallons an acre for the more commonly used soybeans. Algae would also reduce the stress on agricultural land. The difficult challenge right now is identifying or creating algae types with high lipid content and a fast growth rate.

The greatest potential advance in biofuels over the next 10 years is the development of cellulosic ethanol. Cellulosic ethanol can be manufactured from almost everything: from fast-growing plants like switchgrass to the waste products from of agriculture and wood mills. Because it uses waste products or fast growing, environmentally friendly crops, it will produce significantly lower greenhouse gas emissions than other forms of ethanol.

[IAF Senior Fellow Bob Olson](#), who is co-chair of a working group of outside experts advising the Administrator of EPA on biofuels, sums up the situation this way:

Biofuel development could be a key part of the energy transition we need to make, but if it isn't done right it might turn out to be unsustainable both environmentally and economically. How we answer the questions of what, where, and how biomass is grown, processed and delivered will determine whether the effort achieves its potential. Shifting from corn-based to cellulosic ethanol as rapidly as possible is critical for putting biofuel development on a sustainable path.

For more information contact IAF Futurist Craig Bettles at cbettles@altfutures.com.

Cultural Evolution Follows Levels of Development

By [IAF President Jonathan Peck](#)

Younger generations may move through the levels of human cultural evolution more rapidly than we elders could. Because the conditions younger people face are more challenging than those we knew when we were young, they may develop a greater capacity to learn and evolve. One indicator of their faster evolution would be if young voters swing the next election because a sustainable future is a key issue for them.

Why would a sustainable future be a decisive issue for them? Research shows that cultural

evolution follows a cyclical pattern similar to the development of the human psyche. Individuals and cultures move between more self expressive modes--when people emphasize their differences from a larger group--and more communal periods--when people care more about integrating with a larger group. These cycles evolve toward ever increasing complexity that can comprehend bigger problems like global sustainability.

Our country's stages of development have also shifted. America has had a strong collective base supporting a powerful achievement ethic and "can do" mentality. However, we shifted back from a more competitive, individual achievement orientation to a more authoritarian, conformist level in the aftermath of September 11, 2001.

Yet this is not a stable center for America. In fact, we may be preparing to shift up from the level where individual achievement is central to the next stage, which is marked by collective concern for everybody. If so, the transition will include a period of vacillation, which is typical prior to shifts up the spiral. This vacillation may be why our politics seem to swing between fundamentalist and progressive poles. If the next election emphasizes working more collaboratively on complex solutions to global problems, that will signal a transition that means the center of American politics is going to change.

Few adults are aware that adult development continues through developmental stages. Until the last century, not many people even lived long enough to reach many of the levels of development we now recognize.

While we can understand levels below our own (helping us be patient with children) levels above us make as little sense as the advice we adults give to teenagers who just won't listen. The minority of the population who develop to the highest stages can go unnoticed because those stages will just be unrecognizable to those who have not reached them. Finally, some people do not keep developing through stages. They may just develop within a stage, or they may regress.

Our evolution as a society or as a species may also stagnate or regress. Our evolution is an option, not a given. When life conditions change we may try to stay where we are, resisting the change while relying on the coping systems that worked up until now. We may try strategies that used to work before, a form of regression that assures growing frustration. Or we may try to experiment, adapting to change through innovation. These are all options that determine whether we evolve or not.

We can take this idea of evolution through stages to larger cultures such as industries, countries or even the whole of humanity over time. To test this idea and make it more concrete, IAF surveyed executives from the pharmaceutical industry, inviting them to assess strategies that can help their industry evolve. The survey offered strategies that corresponded with multiple stages of development, moving from less to more complexity. This study indicates that pharma strategists do work from multiple levels of complexity, with different people drawn to more or less complex solutions for the industry's problems.

IAF also produced four scenarios on the future of diabetes using this awareness of the levels of human cultural development. The strategies for addressing diabetes in each scenario mirror the stage of cultural development. You can read them [here](#) on the IAF website. For more information contact IAF President Jonathan Peck at jpeck@altfutures.com.

Creating Seamless Experiences in the Physical & Digital Worlds

By [IAF Futurist Craig Bettles](#)

Imagine you are a child visiting your local park in 2017. You pass by a weeping willow tree with its branches hanging low, rustling in the wind. Your cell-phone beeps at you as you near the tree indicating a wealth of information now available to you. With a quick flick of the wrist, the physical and the digital world blurs as a series of augmented reality objects appear on your A/V glasses. You can choose online video; simulations and virtual tours that help you learn more about the life and place of this willow tree in the ecosystem.

This is the vision developed by leading experts at workshop for the National Park Service's [WebRangers](#) website. They discussed the ability of emerging technologies to create new and exciting ways to reach children by blending the physical and the digital worlds.

Today's [digital natives](#) have an amazing ability to access and interact collaboratively online. The children of the future will demand high-tech activities that are fun and interactive. They will need encouragement to put down the video games and explore the natural world.

Richard Louv, a futurist and journalist focused on family, nature and community, believes that today's children suffer from [nature deficit disorder](#) leading to physical, mental and spiritual atrophy. One has only to look at the spiraling rates of [childhood obesity](#) to see the deleterious effects of children not spending enough time outdoors.

Emerging technologies will provide platforms for reversing the [declining rates of park attendance](#) and to address rising rates of obesity. Two key emerging technologies are wireless broadband and physical hyperlinks.

Broadband is rolling out through the nation as major companies compete to own our connectivity. Wireless broadband is only a few years behind and is already available in major cities. Look at the iPhone and you can see that with mobile devices we can use wireless internet access from anywhere to make what we see and hear available to anyone from our own videos to Hollywood movies.

Japan and Europe are leading the way in incorporating physical hyperlinks into our everyday environment. Physical hyperlinks can tie the physical and virtual worlds together so that pulling up information on your mobile device is as easy as clicking a hyperlink in the digital world. These hyperlinks range from simple and proven technologies from barcodes and RFID tags to experimental solutions such as encoding hyperlinks into the [music used in malls](#).

The National Park Service and other organizations will soon be able to capitalize on these emerging technologies making public spaces more interactive. Children will be able to virtually tag locations in National Parks based on either their GPS location or a physical world hyperlink. They will be able to leave virtual notes for Park Rangers, blogs of activities, photos for friends, videos of wildlife and other user generated content. Children could also take friends and family on "collaborative tours" of the park by allowing them to access and watch real time video of the park through their mobile devices.

Park Rangers and other stewards of public spaces will be able to embed virtual items based on physical hyperlinks such as additional information on local flora & fauna, answers to questions and serious games. Serious games, such as [next generation of geo-caching](#), will connect children to the natural world in new and exciting ways.

For more information contact IAF Futurist Craig Bettles at cbettles@altfutures.com.

Upcoming Events

Science and Knowledge Management for Kids, McCormick Elementary School, IAF President & Sr. Futurist Jonathan Peck, November 19th, Prince George's County, MD.

Capturing the Imagination of the Digital Native, National Park Service Chiefs of Interpretation, IAF Futurist Craig Bettles, December 5th, Providence, RI.

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