

# Biofuel for the Future

## How Fuel Alcohol Can Solve Our Energy Problems & Feed the World

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*David Blume started his ecological training young. He and his father Jerry organically grew almost all the food their family ate on a city lot in San Francisco in the mid-1960s. He taught his first ecology class in 1970, and after majoring in Ecological Biology and Biosystematics at San Francisco State University, he worked on experimental projects, first for NASA, and then as a member of the Mother Earth News Eco-Village alternative building and alternative energy teams. When the energy crisis of 1978-79 struck, Blume started the American Homegrown Fuel Co., an educational organization that taught thousands of people how to produce and use low-cost alcohol fuel at home or on the farm. In 1993 he founded the International Institute for Ecological Agriculture, dedicated to healing the planet while providing for the human community with research, education and the implementation of socially just, ecologically sound forms of agriculture. The organization is currently working to establish a driver-owned cooperative biofuels station in Santa Cruz, California — a story enlarged in his book, *Alcohol Can Be a Gas*, and in the interview that follows.*

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### *David Blume*

**ACRES U.S.A.** On the topic of fuel alcohol, we hear both sides — one, it has no future at all, and two, it is the wave of the future. What is your assessment?

**DAVID BLUME.** Basically, alcohol is one of our best answers to peak oil. If we take a look at what's going to happen if we don't go to alcohol or biofuels, it's a pretty bleak future. We're talking about how oil companies would supply us with energy in the future. They're not going to go out of business just because they're running out of oil — they have a plan, and that plan is pretty scary. What they're likely to do is push coal-to-liquid fuel, oil shale to oil, and expand tar sands dramatically to make up for the shortfall in natural petroleum. All of those solutions are tens to thousands of times more toxic and climate-destroying than the current use of petroleum, but those options are precisely what we're going to end up with if we don't start making fuels from renewable sources. Looking at all the possibilities, alcohol is extremely positive from an environmental viewpoint and also from social justice viewpoint in terms of

distributing wealth back to the countryside and away from centralized corporations.

**ACRES U.S.A.** The big perspective that's come down the pike recently has been that the industry is taking corn away from livestock and from people in order to make fuel alcohol. How do you respond to that?

**BLUME.** First of all, when the press says 25 percent of the corn crop has been diverted to make alcohol fuel, that's misleading. Almost 70 percent of each kernel of corn is starch, and starch is something that cattle don't do very well on. We've known for a long time that feeding grain to cows causes acidosis and feedlot bloat and a lot of other problems because cattle aren't really evolved to eat grain. They're mainly browsers — they eat woody brush, they'll eat pretty grass if you give it to them, but when it comes to starch, we're really giving something to cows they aren't biologically meant to eat. When we make alcohol fuel, we take the starch out of that corn in the process, and what's left over is high-quality feed, as far as grain goes, which is mostly 30 percent protein, fat

**“Alcohol is extremely positive from an environmental viewpoint and also from social justice viewpoint in terms of distributing wealth back to the countryside and away from centralized corporations.”**

and mineral and some cellulose, which is basically good for cattle. If we feed that byproduct to cattle instead of the original corn, we actually get about 17 percent more meat. In the case of cattle, then, instead of it being a situation of alcohol reducing the food supply, the opposite is true. Now, you and I both know the best way to feed cattle isn't giving them corn, anyway, but if we are going to do it, we should at least get the starch out of the way.

**ACRES U.S.A.** You mentioned in your book *Alcohol Can Be a Gas* that corn is not necessarily the best feedstock for fuel production. What other feedstocks does your research tell us would be superior?

**BLUME.** Corn is not the best crop to grow everywhere in the United States, anyway — it grows well in certain areas but not in others. Just like you wouldn't grow sugarcane in Ohio because it's too cold there, there are a lot of crops that do really well in particular places and not so well in others, so what we ought to grow is the best crop for energy in the region where conditions are best for it. For instance, in the Southwest, where it's pretty dry, it's pretty hard to grow corn crops — but if you take a look at the natural landscape of the Southwest, you'll find that there are 70 million acres of mesquite trees. That's almost as many acres as we use to grow corn in an average year. Those mesquite trees can actually produce something like 350 gallons of alcohol per acre without any inputs, just by harvesting the pods, which are 35 percent sucrose.

**ACRES U.S.A.** You're just going to use the pods?

**BLUME.** That's right. We can talk about cellulose alcohol in a minute, but let's stick to some of the more conventional crops for the moment. First, sweet sorghum, which will grow as far north as Ohio and all the way down to the very most southern part of the United States, will generate anywhere from 600 to 1,100 gallons of alcohol per acre — the further south, the more alcohol you can produce, because you can get more sorghum cane. Sorghum grows in a wider range of places than corn and uses similar equipment for soil prep and planting, so it's a very easy crop to work into a rotation with other crops. Sugar beets and fodder beets are really good

**“Mesquite trees can actually produce something like 350 gallons of alcohol per acre without any inputs, just by harvesting the pods, which are 35 percent sugar.”**

farther north, where things are cooler and higher yields can be expected — for instance, around 1,100 gallons per acre for fodder beets, and like corn, fodder beets can be stored for most of the year. In Europe dairies base their feed regimen on beets, not on grain. With beets we can get about four times the yield of alcohol because corn only yields about 250 gallons, and we also get twice as much animal feed per acre. Now of course beets, like anything else, should be rotated, you shouldn't grow them in the same place except maybe once every three years. The idea of a number of crops being grown in the Midwest, all of them capable of producing alcohol,

would change the economics for farming in the region. Right now you've got little choice — you can grow corn or you can grow soybeans. I mean, if you have large acreage and you're going to produce a large amount of something, those are the only two crops that anybody buys. Alcohol changes that formula, because an alcohol plant tends to be very flexible in what it takes in to produce its product. Anything with starch or sugar will work.

**ACRES U.S.A.** Are the innovators trying to get some of these other crops besides corn to work now?

**BLUME.** As ecologist Barry Commoner used to say about alcohol, it's always possible to do a good thing stupidly, and the big plants, the 100-million-gallon per year plants are all focused on corn. There are a couple problems with that. First of all, really big plants are not a good idea. These big plants might draw corn from 30 or 40 miles away. Now if we're going to do something like we talked about earlier, closing the nutrient loop where we use the byproducts from the alcohol plant, the leftover mash, to

put it back on the soil, 25 miles is too far to go. Small plants, ones that produce 5 million gallons or less, might take the products from immediately around the plant, maybe 500, maybe 1,500 acres, and maybe a collection of a handful of farmers is all it would take to run that plant. In those cases, all the byproducts can go right back to the land, feeding the soil, so those farmers don't need to buy chemical fertilizer or anything else. Once you have a setup like that, where you're talking about a few farmers around one still, they can all be growing different crops that mature at different times and spread out the harvest season, and they can be rotating those crops between each other. One guy grows sorghum, the

next year he grows beets, the third year he grows Jerusalem artichokes, and the fourth year he might grow something else. There's quite a few crops they could grow. But a small alcohol plant could handle all of it.

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**ACRES U.S.A.** What would it take to implement something like that? First of all, is the alcohol to be consumed in the same area that produces the raw feedstock?

**BLUME.** That's what I'm in favor of. What we promote in the book is that farmers implement a community supported agriculture model for energy. Let's say you've got a million-gallon per year plant that's taking in maybe a thousand acres of good energy crops, grown by maybe two, maybe three, maybe four farmers. First, you go ahead and produce that million gallons. Now it turns out that a pretty busy fuel station in an average town will sell about a million gallons a year, so that's a pretty good match. Next, these farmers could set up in or near town — maybe at the local Grange Hall, which always has a good parking lot — an above-ground tank with a pump where people can pull up, slide their card through, and fill their cars. Those farmers would thus be selling alcohol as a value-added product direct to the consumer. There's no distributors or brokers in the middle, there's no oil companies in the middle, and those farmers are maybe selling that alcohol for \$3 or \$3.50 a gallon and making a sustainable living on the crops they're producing on their land. That million gallons of alcohol might bring in \$2, \$3, \$3.5 million, and the plant cost should only be \$1 million.

**ACRES U.S.A.** It also keeps the money at home, too.

**BLUME.** That's the next step. You buy the alcohol from Bob, who is producing it, Bob goes out and gets his tractor fixed locally with some of the money you gave him, the mechanic takes that money and gets a haircut locally, then the haircutter goes out and gets a massage, and that

money then goes from the massage therapist back to buying vegetables from Bob, who took the byproduct from making alcohol fuel and is now running greenhouses to produce organic vegetables and mushrooms and a lot of other value-added products. All of that can come out of a small alcohol plant, and we go into a lot of detail in the book about how you can take, for instance, the byproduct of corn, the dried storage grains, and feed it to farmed fish, then take the fish water and run that either out into your fields or through greenhouses that are

## **“That's the bottom line that no one's talking about — small-scale alcohol fuel can dramatically revitalize rural areas with locally produced, essentially organic food.”**

growing organic vegetables — the air in which can be supplemented with carbon dioxide from your fermenting tanks, so now you're getting three, four, five times the yield per square foot that you would in an open field. In other words, we start changing the formula for how many thousand acres one guy can farm to having jobs per acre, which are created locally. That's the bottom line that no one's talking about — small-scale alcohol fuel can dramatically revitalize rural areas with locally produced, essentially organic food. I'll tell you, in the middle

of winter in Decatur, you'd be pretty happy to have fresh shrimp produced at the local alcohol plant rather than something frozen and shipped from the coast. So it's far from being a food-versus-fuel issue. A small-scale alcohol plant is a central piece of a really diverse local food product system that produces both energy and food.

**ACRES U.S.A.** You know, social philosopher and author Wendell Barry one time wrote that he was something of a Luddite in this sense — he said that while he was not against having machinery, he wouldn't hesitate to put the machine to death in order to save the community rather than let the machine put the community to death to save the financiers.

**BLUME.** Exactly. We're taking the same philosophy and saying let's turn the machine into something that builds community.

**ACRES U.S.A.** If it can't build community, then it doesn't belong.

**BLUME.** And that's exactly the Amish philosophy about farming — if it doesn't build community, then that machine isn't adopted. That's a good philosophy.

**ACRES U.S.A.** We've discussed some of these models way back even before the Carter administration, and as a matter of fact, we ran articles on it in a little magazine called *Gasohol U.S.A.* Why can't we get our public policy to accommodate this model you're talking about and that we've talked about now for decades?

**BLUME.** Because public policy right now is framed by major corporations. The business model we just talked about essentially puts people directly in contact with the producers, the farmers, and as

we both know, that means more than a trillion dollars' worth of income for corporations in the food industry alone, not even counting the energy industry. So this is definitely not going to be done by government, and it's not going to be done by corporations — it's going to be done locally by entrepreneurs. Also, up until recently gasoline was too cheap for us to make this model work, because basically the margin you'd have on alcohol fuel wouldn't work, but now that things have changed permanently, now that we're actually running out of oil, this kind of model is actually going to be forced into existence over the objections of the government and the corporations. People are just going to start doing it.

**ACRES U.S.A.** We do have a public relations problem, and this is the one where they're constantly drumming the idea that if you use agriculture to create fuel, people will starve to death. How do you answer that?

**BLUME.** You know that whole propaganda ploy from back in 1978, "Food Versus Fuel," was coined by the American Petroleum Institute in a press release. They've just trotted it out again because it's a very hard argument to fight against. It's a moral argument — in other words, how dare you take the food away from starving Africans to put it in your SUV? The problem with this argument is that every bit of it is a lie. Right now we have twice as many calories being produced in the world as we need to feed everyone on the planet. Farmers are very productive — so productive, in fact, that we can't even find places to sell everything we can grow. The problem is that food unfortunately is a commodity, and that means you have to have money to buy it. So the poor are not starving because there's a lack of food, they're starving from a lack of money. Now, if you're in Brazil and you start an alcohol plant in your village and you make money selling this value-added product, then you now have money to buy food. So first of all, alcohol fuel on an international basis gives a great hand-up to people who are running small plants around the world.

**ACRES U.S.A.** So the argument is fundamentally flawed.

**BLUME.** Right. Now for the food-versus-fuel arguments of today — first of all, ethanol is getting blamed for the increased price of corn, which is supposedly causing people to go hungry. The increased price of corn has nothing to do with alcohol fuel and everything to

## "The poor are not starving because there's a lack of food, they're starving from a lack of money."

do with the price of oil, as well as a little bit to do with profit-taking by the food manufacturers. Up until this year, when you took a look at a box of cornflakes, you were looking at a price of \$4.50, and 5 cents of that price was the corn. Now prices have gone up, and out of that box of cornflakes that now costs 50 cents more, the corn accounts for maybe 7 or 8 cents. Where is all the rest of the money going? Other than the profit, how about the bag that holds the cornflakes that's inside the box? That's more costly than the corn. How about the energy it took to cook the corn to make the cornflakes? That takes oil, and it costs more money than the corn. How about the box itself and the energy it took to pulp trees? Can you imagine how much energy it takes to pulp trees and to make the millions of boxes you need to sell the cornflakes? The ink on the outside of the box is made from oil, and that's more expensive than the corn inside. Then you throw the whole thing on a truck, a box mostly full of air, and you ship it halfway across the country from the Midwest to California, and it's easy to see that the energy to ship it is certainly way more expensive than the corn in the box. So when the price of oil or energy goes up, all the components that go into making that box of cornflakes go up in turn. When you start talking about the demand for ethanol causing the price of fuel to go up, that's pure nonsense. But there's even a bigger reason why it's nonsense — last year we had the biggest corn crop in 33 years. We had so much corn last year we didn't have enough silos to put it in. We couldn't even pile it up fast enough outside of the elevators. If you're going to have a theory that says competition between ethanol and food is driving up

the price of food, then you have to have a shortage of the food, too.

**ACRES U.S.A.** You also have to have people who seem to know nothing about the speculative markets.

**BLUME.** That's the place to go next, which is who is buying these corn contracts? Almost a year ago, we pointed out that oil companies were buying inflated corn contracts to drive up the price of corn and basically inhibit this huge amount of capital that was pouring into alcohol plants. We said watch, the price of corn is going to go to \$5, and boy did it ever! Now there are pretty good reports coming out that the futures trading system, which is completely unregulated, is being gamed by both the oil companies and by OPEC and basically driving up the price of food. You might say they're putting money in the pockets of farmers with one hand but pick-pocketing it with the other by raising the price of all the inputs dramatically. You take a look at the profits of companies like General Mills or Kellogg's and they're not down because of the price of corn — they're up 60, 80, 90 percent because those futures contracts the oil companies have been buying, they're not making a profit on those, they're selling the corn for \$3 a bushel just like they always did — they're taking a loss in an attempt to crush the biofuels industry.

**ACRES U.S.A.** Is there a danger that speculators are going to drop it on the farmer after they get them used to having it up to a certain level — suddenly drop it down and break everybody that way, especially the alcohol plants?

**BLUME.** That's the other half of what I just described. The oil companies get the price up, and then they raise the price of all the inputs, but when the price crashes, they're not going to reduce the price of the inputs. They'll break the farmers.

**ACRES U.S.A.** Let's move on to cellulose alcohol — is technology going to make it feasible? If so, we could grow poplar trees along the highways in the rainbelt parts of the country at tape-measure intervals, harvest them every couple of years, and probably fuel the entire automobile fleet of the United States. Is that feasible? Are we ever going to have cellulose alcohol?

**“If you ask me where the innovation is in the United States today, it's where it's always been — it's on the farm.”**

**BLUME.** First of all, cellulose fuel is actually being made right now for 50 cents a gallon in Brazil. They're making it using an old process called acid hydrolysis, which is not patentable anymore and therefore nobody in the United States wants to use it. They're doing it with sugarcane fiber left over from crushing the cane. So we already know how to do it.

**ACRES U.S.A.** Just the bagasse?

**BLUME.** That's right. But that's not the whole thing. Basically, the question we're looking at is how do we get the yield up so we don't need as much land? That's the big problem with cellulose. There are a couple of ways of doing it that don't require cellulose, so let's look at them first. By the side of the road, especially in rainy, wet areas, what plant do you frequently see? Think about it, going down the road, they're big green plants, look a lot like sugarcane, have little hot dogs on a stick for flowers? They're cattails. Now cattails are pretty interesting plants because there are 500 places around the country currently processing sewage using cattails. The sewage plant does the first part of the processing, and then before they release the water into the river or ocean, they run it through a cattail marsh. The cattails take all the dissolved nutrients out of the water, which leaves the marsh pretty darn clean. When you grow cattails under those conditions, using sewage, you can yield 7,500 gallons of alcohol per acre compared to corn at 250, and that's a simple starch recipe.

We don't need any fancy technology to do this! If you do the simple math, if every county in the United States took its sewage and processed it through cattail marshes, we would need less than 2 percent of the equivalent of all of our farmland to make all the alcohol we would need to replace all the gasoline and diesel in the United States. Less than 2 percent

of the equivalent land — and it wouldn't all have to be farmland! Artificial cattail marshes don't have to be on good land.

**ACRES U.S.A.** Are you suggesting that we could have something akin to a rice paddy, but using the effluent from the sewage instead of good water?

**BLUME.** They already do it — they just don't harvest the cattails and make alcohol from them. A lot of rural sewage treatment plants are now using wet marshes full of cattails.

**ACRES U.S.A.** How easy is it to harvest the cattails? Is it like harvesting rice? Do you dry up the pond or what?

**BLUME.** First I dry up the pond. I mow the tops and use that for hay, blowing it with a silage cutter off to the side and into a cart, and then I use the silage cutter on the second pass and take the bottom 3 feet, where all the starch is. We can then use two enzymes to break the starch down into sugar, ferment it into alcohol, and we're there. What I'm saying is we don't have to go to cellulose to replace all the fuel in the country, and we can do it with a fraction of the land at the same time that we clean up our environment. There are other ways to go about making alcohol on a big scale, and we can do it without using any farm land at all.

**ACRES U.S.A.** How is that possible?

**BLUME.** Every Norwegian fisherman you talk to will tell you about kelp. We

talk about this in the book where the kelp that grows offshore can be grown like the Chinese do it, on floating nets. We're not talking about infringing on the natural habitat of kelp — we're talking about going out where it's a little deeper, spreading nets on the surface, and growing it there — kelp grows a foot and a half a day! And it's made out of fructose, basically sugar. We can process that kelp very easily into alcohol — the American Gas Association studied this back in the 1980s, back during our previous energy crisis. They said that we could produce 15 quads of energy — quad is a big number, it's a quadrillion BTU — from the kelp off the California coast alone. To put that in perspective, all the gasoline and diesel in the country we use is only 23 million quads, so most of the fuel could have been supplied simply by cleaning up the pollution in the water off California and taking that kelp and making alcohol. Now as you know, organic farmers around the world use fish emulsion and kelp solution for fertilizer, and the kelp solution left over after making the alcohol has all these incredible nutrients. We could take the pipelines that we've been using for oil and deliver kelp solution back out to the Midwest for farmers to use instead of petroleum-based fertilizers. We thus not only recover the nutrients that are dumped in the ocean and turn them into fuel, but we also return all those trace nutrients back to the soil where they originated. There's no reason why we couldn't do this with existing technology, no new breakthroughs — we can do it today.

**ACRES U.S.A.** Have you been successful in getting anyone to adopt one of these models and getting that kind of a plant established? It appears to us about the only plants now being constructed are based on corn.

**BLUME.** In Brazil they're building a plant right now based on cellulose. In terms of cattail starch, we did this ourselves back in the '80s in Arcadia, California — the site of the first cattail marsh sewage system. In terms of the integrated farm where you'd take the byproduct from making the alcohol and produce fish with it and then take the fish solution and

grow vegetables, Archer Daniels Midland did that with 10 acres of greenhouses in Decatur. They took the byproduct from alcohol fuel and raised tilapia, and they took the tilapia water and used it to raise lettuce. The interesting thing about this was, there was no economy of scale — basically, every cubic foot of water will produce a pound of fish every six months. Archer Daniels had 180 tanks, but any one of us could have two of these tanks in a greenhouse on our farm and produce \$150,000 worth of fish, sold locally, using the byproduct from our own alcohol plant and be just as efficient as Archer Daniels was with a 10-acre greenhouse.

**ACRES U.S.A.** You said “was” — do they still do it?

**BLUME.** Get this — a couple of years ago the new president of the board of Archer Daniels Midland came from Chevron Oil, and she said those greenhouses were not part of their core business. She had them pulled, undoubtedly because they showed a green solution that was frightening in its implications for oil. Archer Daniels Midland had been delivering that fish, still swimming, to restaurants and markets all over the East Coast in trucks running on bio-diesel from their own soybean oil. If a giant corporation like that can think that green, we small guys can do a much better job and we can do it closer and local. So yes, all the parts of the system I’m talking about have been done, and we’re hoping to build a working model once we find a good piece of land in the next year or two so that farmers from anywhere can come out, put their hands on it, and see how the whole thing works together.

**ACRES U.S.A.** Are you going to have filling stations that make the fuel available to the contiguous community?

**BLUME.** We already have funding for the station, and it should be up and running in six months. Then we’ll put in the plant that will supply that station — a small plant producing about a million gallons per year. We’re going to show the whole cycle in Santa Cruz, California.

**ACRES U.S.A.** And you’re basically saying such innovation is on the way whether the oil companies like it or not.

**BLUME.** If you ask me where the innovation is in the United States today, it’s where it’s always been — it’s on the farm. The people who have been smartest and know how to make things work have always been on the farm, so the people that are going to make this work are the farmers.

**ACRES U.S.A.** Not the universities.

**BLUME.** Not the universities. The only thing that the farmers need now is good information, a decent set of drawings and a basic outline of how to make it work, and they’ll adapt it for their local community and make it happen. That’s why I wrote the book — everything the farmers need to know to start a program like this is in the book, there’s nothing held back, no secret sauce, nothing you have to buy extra, it’s all there, how to make the alcohol, how to raise the fish, and so on.

**ACRES U.S.A.** We had some false starts back about the time of the Carter administration, when farmers thought they could set up a little still in their barn and cook their own alcohol. They discovered that you had to keep it about as clean as a hospital amphitheater, however, so we bypassed the idea that it’s an individual farmer’s thing. It has to be a company or a co-op or something like that, isn’t that correct?

## “We’re saying let’s turn the machine into something that *builds* community.”

**BLUME.** I disagree with that. I think a practical-sized operation would probably be in the 250,000-gallon range, but that size plant would fit in the average guy’s barn, and the making of alcohol is not rocket science. Look at whiskey — there are small distilleries everywhere that make alcohol. It’s not that complicated. You do need to do things properly, correctly, and there are some details involved, but once you know those, you can be successful. Making alcohol is mankind’s second-

oldest profession — we’re really good at this. We do it more energy-efficiently nowadays, we have better materials to work with, and we can buy really good enzymes for cheap — but basically it’s the same thing farmers did for centuries, making whiskey and selling it on the side to pay off the note. Now, the modern alcohol plant is more than just making alcohol, it’s about making all the byproducts count and making sure you take care of your soil in the process without using chemicals. If we can take the oil companies completely out of the loop, they can’t influence your prices anymore — they can’t tamper with the price of fertilizer and make your alcohol more expensive if you’re not buying it from them. They can’t inflate your costs by increasing the price of RoundUp Ready seed 200 percent in five years because you’re not using that seed — you’re saving your own, and you’re doing your weed control using byproducts from the alcohol process.

**ACRES U.S.A.** You’re buoyantly optimistic about how this is going to work. What do you feel will actually trigger a real start or movement in this direction?

**BLUME.** I think it’s already started. People are now getting the picture that we have reached peak oil. The price is going up, and they can’t stop it from going up because there is not enough oil to go around right now. I talk to colleagues, people in farming, in the government, in colleges, in Africa, in

Latin America, and they’re all saying the same thing. They’re saying, “We’re not getting full deliveries of our fuel anymore. We need x-gallons of diesel, but they’re only delivering two-thirds of that because they’re saying they don’t have enough.” They’re paying \$12 a gallon in South Africa, and the Australian National Farmers’ Federation called me the other day saying they’re paying \$10 a gallon. So the incentive is there and the economics are there — the thing that killed the alco-

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## INTERVIEW

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hol movement in the '80s was the drop in the price of gasoline to \$10 a barrel under the Reagan/Bush administration. If the prices had stayed up, farmers would have stayed in business making alcohol.

**ACRES U.S.A.** If you factor in the intelligence upon which most economists agree, 40 percent of the military budget is used to keep the oil pipelines and ship lanes open. If you added that to the price of a gallon of gasoline, it'd probably have to sell for around \$18 a gallon. Would you have a comment on that?

**BLUME.** The world uses 500 billion gallons of fuel a year — that's the whole world, not just the United States. Now, to build an alcohol plant, once you've got it down, only costs about a dollar per gallon of production. So if you want to build a 5 million gallon a year alcohol plant, it might cost you \$5 million if you bought all new parts. Thus, 500 billion gallons of production would take an investment of

\$500 billion — that's how much money we need to replace all of the gasoline and diesel on the entire planet. That's a big number, \$500 billion, but look at what we've spent in Iraq already — we've spent more than \$500 billion there, and we're still spending. If we had spent that money building alcohol plants in every country in the world, alcohol plants that make fuel, raise fish, raise vegetables, raise crops — that basically provided the whole world with all the energy and all the food it needed — what would we have left to fight over?

For more information on David Blume and the International Institute for Ecological Agriculture, visit [www.permaculture.com](http://www.permaculture.com). Blume's book, *Alcohol Can Be a Gas*, is available from the Acres U.S.A. bookstore.

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