



►Lipid-extracted algae is the latest co-product of the biofuel industry. It is being researched as an alternative protein supplement for both feedlot and range cattle.

# Green Feed

## Biofuel industry creates another alternative protein supplement for cattle.

by **Paige Nelson**, field editor

One might surely reason that ruminant animals, especially cattle, are the most versatile of all the livestock species. Ruminants can utilize nutrients from sources of the poorest quality to the highest quality. They eat feed humans could use only for fire starter.

Arguably, cattle produce the best-tasting protein source out there, and almost all the steers, heifers, cows and bulls that are eventually harvested for their meat have been fed at one time or another a byproduct feed.

Demand for corn and grain grown solely for human consumption will continue to increase, as will demand for protein produced from noncompeting feedstuffs. Cattle continue to prove themselves as a top-shelf protein for taste and because they eat what other livestock animals can't.

A good mama cow can wean a 500-pound (lb.) calf on native mountain or desert pasture on which other species would only be lost or eaten and any attempt to farm would be a waste.

"It's a neat feature of the cow that I don't think beef producers talk enough about," says Tryon Wickersham, Texas A&M University

associate professor of animal nutrition. "Our ability to take coproducts, whether that's gin trash or distillers' grains or wheat straw, and turn it into something that people can and want to consume while providing a great source of nutrients."



►Researchers Wickersham and Ivey haven't experienced issues with cattle refusing to eat the algae coproduct. After it has been dried, it can be fed as either a powder using a total mixed ration (TMR) mixer, or it can be pelleted and spread on the ground, similar to range cubes.

Since 2009, Wickersham has been working with a coproduct of the biofuel industry for use as a protein supplement for cattle. Different oil-producing strains of algae are grown either in open ponds, primarily in the Southwest and other warm climates, or in photobioreactors, a plastic tube with warm water circulating through. At the end of the growth stage, the oil component of the algae is extracted for fuel, but the protein component is left behind.

"There's a leftover component that we feed, it's basically like the distillers' grains of ethanol or soybeans from soybean oil," Wickersham explains.

What is it like?

Shanna Ivey, associate professor of Animal and Range Sciences at New Mexico State University, who has studied lipid-extracted algae (LEA) for the past five years describes the algae coproduct as a dry, granular material that varies in color depending on strain and extraction method. Most often it is a bright green color, but some can be a very dark, almost black color.

She says it does have a smell. Algae that has been extracted using a solvent smells like the solvent, while other algae have a slight fishy odor.

Due to a lag in extraction infrastructure, unextracted algae is still wet and can be fed as such, but its shelf life is much longer if it is dried. Many current extraction methods require drying the algae prior to oil extraction. Drying is expensive and uses about half of the energy the biofuel creates.

Feeding the product wet, however, would

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dramatically decrease costs but would make the feed only available to those close by.

The LEA also has a salt component to it, as well.

“Most algae that they are looking at, in terms of biofuel, do best in salt water. We can grow other crops with fresh water, so using salt water doesn’t compete directly with other types of crops,” says Wickersham. The salt lingers in the extracted algae and actually decreases the amount of salt required in the overall ration.

### Feeding algae

Like all other animal feeds, LEA must be approved for use as a feed ingredient, which Wickersham says can be handled in several ways. The Association of American Feed Control Officials (AAFCO) is responsible for approving national feed ingredients. However, according to Wickersham, many states have their own state chemist or feed regulatory board, meaning a feed might be approved for use in one state and not another.

Ivey says in her conversations with the Food and Drug Administration (FDA) and the USDA the water around approval for feeding LEA is still very cloudy. Several different proprietary strains of algae and several extraction methods are used in the making of biofuel. It could possibly be that an approval will be needed for each species by processing method.

Before approval can happen, the research must prove algae’s usability. Both Ivey and Wickersham have been researching LEA’s impact on intake and digestion. Wickersham has even looked at meat quality.

Yet first, will the cattle even eat it?

“We have not had any intake issues. We’ve done a heifer supplement study, and they ate the heck out of it,” says Ivey.

Wickersham didn’t experience palatability problems either.

“We’ve fed it straight as a protein supplement to grazing cattle, and they will consume it. They tend to consume it in small bouts throughout the day and that has to do with the salt content and their need to drink and balance osmolarity.”

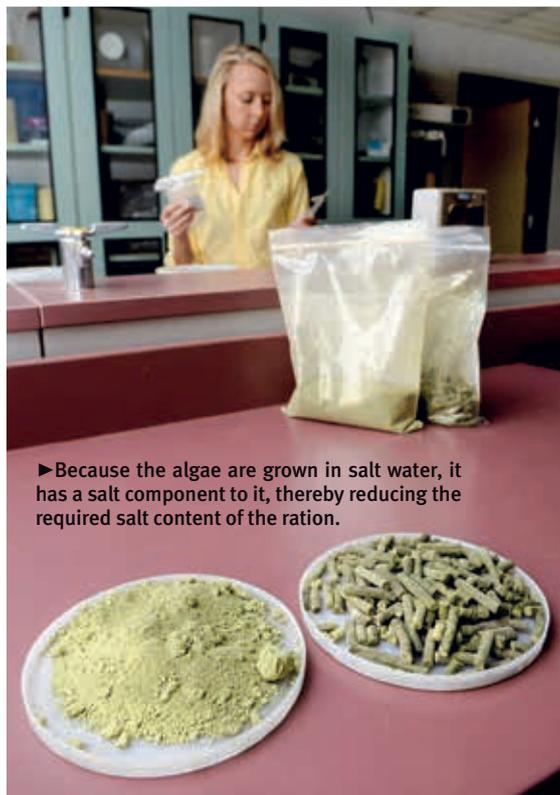
It wasn’t until greater than 15% algae in

the ration that Wickersham started to notice palatability problems.

Because most often the extracted algae is dry, both Wickersham and Ivey were able to mix it into the feed easily, but they both advise giving it something to stick to, like molasses or a high-moisture feed.

**We’re not going to generate a high-quality source of amino acids and just throw it away.”**

**— Tryon Wickersham**



► Because the algae are grown in salt water, it has a salt component to it, thereby reducing the required salt content of the ration.

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In one experiment Wickersham used extracted algae as an alternative protein supplement to cottonseed meal or soybean meal.

“A common problem in the West is in the winter we don’t have enough protein in our forage, so we’ll deliver a protein supplement. We wanted to see if we could

use algae to replace cottonseed meal or soybean meal.

“It did a good job. It increased forage intake, increased forage utilization and behaved just like a cottonseed meal supplement. It was just their pattern of consumption was different,” he notes.

He also tested LEA’s influence on meat quality. Using approved extracted algae; Wickersham fed a little less than 10% algae of a finishing diet to steers in the last 30 days before harvest.

“It slightly increased marbling, but other than that, it had no

other effect on meat quality based on a sensory panel,” he says.

### Future as a feed source

“When we extract oil, there’s a high-protein supplement left over; people are going to want to feed that to animals because protein is typically expensive. We’re not going to generate a high-quality source of amino acids and just throw it away,” says Wickersham.

However, he says, “It’s going to be a while before we see it, if we ever see it, at the same level like we see distillers’ grains.”

Ivey thinks we may not really ever see it.

“Right now the most preferred method (for lipid extraction for biofuel) is hydrothermal liquefaction. What comes out of that is basically a biochar, so there’s not going to be a coproduct that we’re going to be interested in,” she cautions.

Wickersham sees another avenue of interest for the cattle-feeding industry, however.

“Algae farmers are growing essential fatty acids, omega-3 fatty acids, and they’re creating that oil for human supplements or animal supplements. Then they have a leftover product that they’re interested in using as byproduct feed,” he says.

It’s brand new research.

“We can use algae as a way to increase the omega-3 fatty acids in different products. I think that’s something a lot of people are interested in understanding — a way we could increase or improve the amount of omega-3 in a beef product.”

Although it may not be on its way to a store near you, the research on algae, whether as a lipid-extracted protein supplement or as an omega-3 fatty acid source, continues.



**Editor’s Note:** Paige Nelson is a cattlemoan and freelance writer from Rigby, Idaho.