Can Mushrooms Improve Cattle Farming?

Integrating cattle and mushroom production with abundant corn stover
could yield year-round farm profitability

Greensboro, NC – August 1, 2019 – Drs. Uchenna Anele, Omon Isikhuemhen, Felicia Anike and Obed Quaicoe are researchers in the College of Agriculture and Environmental Sciences who are working on integrating mushroom and cattle production. The team recently received a three-year, $500k grant from the United States Department of Agriculture through the National Institute of Food and Agriculture (NIFA) as part of its Agriculture and Food Research Initiative (AFRI) program.

The AFRI program is the nation's leading competitive grants program for agricultural sciences. The team is using its AFRI grant to explore how the use of a mushroom-based feed supplement might improve how U.S. farmers feed their cattle.

As the leading beef producer in the world with annual output of 25-27 billion pounds, the U.S. beef cattle production system begins with cow/calf operations that typically occur on pastures and rangelands, all the way to cattle feedlots that focus on finishing cattle on grain before slaughter. During the early stages of cow/calf operations, production costs increase remarkably during the winter months when pastures are less productive. As a result, cattle farmers use supplemental feeding of previously-harvested and stored forages (hay and straw for example) and other agro-industrial byproducts.

Corn stover is the most abundant agricultural waste produced in the U.S. at over 200 million tons annually.

For small-to-medium sized cattle farmers, the winter season poses major challenges to sustainability and profitability. The cost of feed during the winter season is especially high, hence farmers must choose between using their land for crops or livestock production. These farmers also lack the ability to create short-term, regular income flow throughout the year.

Corn stover is the dried, decayed leaf and stem matter left on the field (and spit out of a harvester) after cobs are picked and shelled. While stover is America's most plentiful crop residue after harvest, it's not very appealing as a livestock feed. Even after you process it into bite-sized pellets (not an inexpensive process) it just isn't nutritious. It contains a lot of tough plant fiber (called lignin) and

if you were a cow, you probably wouldn't enjoy chewing stover. After all, the corn plant has done its work growing nutritious corn kernels; the stover represents spent scraps.

What if there was an affordable way to fortify corn stover and make it easier for cattle to eat? And, beyond that, what if there were additional economic benefits to farmers using that fortification process?

ENTER THE MUSHROOM.

It's probably been awhile since you thought about fungi and their benefits if any, so let's review. Mushrooms are organisms that grow from spores, not seeds, which means they grow in a very different way from plants. Mushrooms grow into extremely nutritious, vitamin-filled edibles by feasting on substances such as sawdust, grain, wood plugs, straw, wood chips, plus liquid for nourishment.

Oyster mushrooms like to grow on moist woody substrates like corn stover.

Are you wondering if mushrooms will grow on corn stover? Dr. Isikhuemhen's previous work in Germany and recent work with Dr. Anike here at N.C. A&T already established the possibility! Now it's time to test the concept at small farmer sites and see how the science and economics add up.

There is a possibility that the production of mushrooms and the simultaneous utilization of abundant, low-cost corn stover could really improve the financial landscape for farmers, while resulting in happier, healthier cattle. The team believes that cultivating mushrooms on corn stover will:

• Alleviate financial challenges for farmers by utilizing cheap and plentiful corn stover especially for winter feeding of cows
• Break down the lignin in the corn stover making it appealing and easy to digest
• Release nutrients and bioactive compounds into the stover which makes it more nutritious
• Improve the gut microbiome in cattle
• Produce mushrooms, a tasty, nutritious, high-margin, year-round crop for farmers to sell

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This research project is a win, win, win, win, win: for science, for farmers, for cattle, for the environment and for consumers. This research project will be executed by a team comprised of an animal scientist, a mushroom scientist, a biotechnologist, an economist and a group of small farmers of cattle and mushrooms in North Carolina. The project is a model for transdisciplinary research in agriculture today, and here's how we expect it will work:

Participating mushroom substrate producers will make and deliver ready-to-fruit substrates to cattle farmers who will "fruit" (produce) and sell the mushrooms on a weekly or biweekly basis.

Spent mushroom substrate (left over after fruiting) will be used for feeding trials in cattle. Data such as animal growth parameters, changes in gut microbiome as health indicators, blood parameters, quantity/value of mushroom yield and changes in farm profitability will be evaluated.

Dr. Anele believes the integration of exotic mushroom and cattle production can be of immense advantage in a small farm environment because mushrooms can act as a continuous source of income to farmers (daily-weekly sales) while generating bio-fortified biomass as a cheap source of animal feed, especially during the winter months when grazing is not possible in many U.S. states.