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The Language of Carbon Footprints

Nyles Peterson, UCCE San Bernardino County

It is hard to think about much else than the tough economic dairy condition, but if you haven’t started to think about the carbon footprint of your dairy, it is probably time to start.

Let’s begin with a few basics. First of all, **what is meant by carbon footprint?** A carbon footprint is defined as the “total greenhouse gas emissions that are caused directly and indirectly by an individual, operation, industry, or organization” and is expressed as kg of carbon dioxide.



Why are they called greenhouse gases? Greenhouse gases are so-called because they are believed to be warming the earth in much the same way that a greenhouse warms plants. Heat from the sun penetrates the atmosphere, strikes the earth and, under normal conditions, is reflected back into space. This process keeps the earth’s temperature relatively constant. Greenhouse gases, however, trap solar heat in the earth’s atmosphere and prevent it from being reflected away, thus causing an overall temperature increase.

What are they? The greenhouse gases are carbon dioxide, methane, nitrous oxide, and human-made fluorocarbons and hexafluorides.

Aren’t all gases the same? No, methane is 23 times more potent as a greenhouse gas than carbon dioxide, and nitrous oxide is 298 times more potent. This means that one molecule of nitrous oxide released into the atmosphere traps as much heat as 298 carbon dioxide molecules.

How is the carbon footprint calculated? The total carbon footprint of an industry or individual operation is calculated by multiplying methane emissions by 23, nitrous oxide emissions by 298 and adding them to carbon dioxide emissions.

To accurately measure a carbon footprint, we need to consider all emission sources related to the operation: for example, for the feed operation on the dairy, we need to include both direct emissions (e.g. the carbon dioxide emitted by the truck feeding the animals) and indirect emissions (e.g. the carbon dioxide emitted in the making of the chemical fertilizer used to grow the crops being fed).

How can we compare different sized dairies? The carbon footprint of a 50-cow dairy is obviously much smaller than that of a 5,000-cow dairy, but so is the total amount of milk produced. To be able to compare herds of different sizes and management styles, the carbon footprint of a dairy must be expressed per pound, cwt, or gallon of milk produced.

The next article in this series will look at ways you can reduce the carbon footprint of your dairy.

Productivity, Excellence and Giftedness

Gregorio Billikopf, UCCE Agricultural Labor Management Farm Advisor

A few months ago I had a very stimulating conversation with a renowned physician and pathologist, Oliver Stanton, and Anders Ericsson, author of the *Harvard Business Review* (HBR) paper, “The Making of an Expert.”¹ The HBR article centers on the old question, “Are gifted people—or those who succeed in a field—born or made?” This has been the question that dairy employers have asked over the years. “Can I train my weaker employees by putting them alongside the best to bring them up to the level of these outstanding employees?” Anders Ericsson, et. al. suggests that indeed there are differences in giftedness, but that for the most part, experts and gifted performers are made, not born. In their paper they introduce three concepts that I wish to share here: 1) the importance of *deliberate practice*, 2) the avoidance of *creeping intuition* and 3) the value of providing *excellent coaches*.



Anders has found that behind excellence there is almost always a lot of practice. He uses the expression *deliberate practice* because it is one thing to rehearse what one has already conquered, but deliberate practice involves working on those areas that do not come so effortlessly. For those truly seeking to excel, the paper recommends two hours per day of such focused practice. Many incorrectly come to think that these gifts just fall on people’s laps. One sportsman explained that people perceive him as a natural golfer, but what they do not see are the endless hours of practice that often yield bloody hands.

The second concept, *creeping intuition*, is the refusal of those who excel to automatically classify new information as something they have already seen before. Individuals who avoid the creeping intuition trap do not allow themselves to think they have already learned what there is to learn. Successful individuals do not fall into a rut.

My own perspective on the topic of giftedness, productivity, and excellence goes along these lines: There are great differences in individual productivity at the farm, and these follow a normal distribution curve. My studies show that the best worker is typically capable of working 4 to 8 times faster than the worst anytime you compare 20 workers doing similar type work, such as herd managers, calf feeders, etc.

Differences in capability and productivity include the ability to discern issues of quality, not just faster work. I am a great believer in *job sample* tests for all applicants, from veterinarians, to nutritionists, from herd managers to calf feeders and milkers. I like the formula: Productivity = Ability x Motivation. I have come to the conclusion that each one of us is born with specific inherent potential gifts. Some may give up too soon, supposing that if they were really good at something, success would be quickly manifested.

Dairy farmers often tell me, “Give me someone with the right attitude over someone with a lot of skill.” I contend that this is not an either/or proposition. I say, “Give me a person with the right attitude—a passion for learning—who also has inherent talent.”

A validated job sample test is an excellent investment because it helps us detect and hire people who are good for the job at the dairy and reject those who would have failed at the same. True, even a valid test is not perfect—although it beats the interview any day—in that 1) a few will excel on the test yet do poorly on the job, and 2) a few that failed the test would have excelled on the job. For me, the answer to the question, “Are gifted people born or made?” has to be a resounding, *it takes both*.

¹ Anders Ericsson, Michael J. Prietula, and Edward T. Cokely, July-August 2007. Ericsson is also the editor of the book *Development of Professional Expertise: Toward Measurement of Expert Performance and Design of Optimal Learning Environments* (Cambridge University Press, 576 pp, 2009).

Prevent Residue Violations in Animals from Your Facility

Betsy Karle, UCCE Glenn and Tehama Counties

In order to get a handle on drug residue violations, the U.S. Department of Agriculture Food Safety and Inspection Service (FSIS) is requiring slaughter establishments to provide information about the source of all animals found to have violating residues. Animals from these sources (i.e. “Dairy A”) require increased testing and establishments have been encouraged to stop purchasing animals from “same source suppliers” if violations continue. Records of violations are maintained and updated weekly on <http://www.fsis.usda.gov/Science/Chemistry/index.asp>. Once a “source” has a violation, they stay on this list for 12 months. So, how do you stay off of this list? Here are some suggestions:

- Follow label directions on all pharmaceuticals - never use a drug off label without a veterinarian’s prescription and adhere to withdrawal times.
- Develop and follow treatment protocols with your veterinarian. Ask your veterinarian if you are unsure about a drug’s use.
- Follow the recommendations on the “Cull Cow Transport Checklist” barn chart (your farm advisor has these if you need a copy).
- Give auction yards and slaughter establishments accurate and complete information about the source of the animal.
- Keep records (including ID #'s) of the animals you take to market.

Prevention & Control of Johne’s Disease¹

Gerald Higginbotham, UCCE Fresno and Madera Counties

Mycobacterium avium paratuberculosis (MAP), the organism that causes Johne’s disease, is widely spread in US dairy herds. A national study of U.S. dairies, Dairy NAHMS 2007, found that 68.1 percent of U.S. dairy operations are infected with MAP, and that at least 25 percent of U.S. dairy operations may have relatively high percentage of Johne’s disease-infected cows in their herds. Lost productivity due to Johne’s disease in U.S. dairy herds is estimated between \$200 million and \$250 million annually.



Johne’s disease is a slow, progressive, contagious, untreatable bacterial disease that ordinarily infects calves. Infected animals tend not to show clinical signs until three or more years of age. These signs include unexplainable weight loss, diarrhea that does not respond to treatment and loss of milk production. In the later stages of the infection, animals can become weak.

Transmission of Johne’s Disease

Infected animals shed bacteria in their feces, colostrum and milk. Also, infected mothers can pass the disease on to their offspring. Most commonly, calves are infected by ingesting MAP bacteria from manure-contaminated udders, milk, water or feed. MAP is an extremely hardy bacterium that can survive in the environment for one year, as it resists heat, cold and drying.

Management Risk Assessment

Johne’s disease should be managed as a herd problem and not treated as an individual cow disease. To manage the spread of Johne’s disease in your herd you should:

1. Prevent **newborns** from ingesting MAP contaminated manure while in the maternity pen. Considerations include ground and pen surfaces, contaminated udders and teats, suckling colostrum from an infected cow or manure contamination of a calf’s body surfaces.
2. Prevent **young calves** from ingesting MAP contaminated manure. Consider all sources for potential manure contamination including colostrum or milk from infected cows, accidental contamination of any colostrum, milk, feed, or pen surfaces from mature cattle, utensils, equipment, traffic splatter or people.

FOCUS ON PREVENTION. Your veterinarian can help you develop a Johne’s disease prevention and control plan and can implement testing strategies to identify the most infectious animals.

¹Adapted from: Steps to Help Prevent Control Johne's Disease, Johne's Disease Newsletter, Vol. 1, Number 1. Teres Lambert-Editor.

UPDATE: Tail Docking Practices in California Dairies

Noelia Silva-del-Río, UCCE Tulare County and Pete Kistler, DVM and Betsy Karle, UCCE Glenn County

A follow up to the tail docking practices survey, previously published in the CA Dairy Newsletter - March 2009, has recently been conducted. The update takes into account herds that left in the CWT program and herds that stopped using tail docking practices. Results are shown in **Table 1**.

Table 1. Tail docking practices in California as a percentage of cows and as a percentage of herds.

	February-09		September-09	
	Cows	Herds	Cows	Herds
North Sacramento Valley	6.8% (n=27,602)	3.3% (n=60)	7.1% (n=26,362)	3.5% (n=57)
San Joaquin Valley	11.7% (n=268,602)	10.8% (n=111)	7.4% (n=260,587)	6.5% (n=108)
Total	11.3% (n=294,339)	9.4% (n=171)	7.4% (n=286,949)	5.4% (n=165)

Note: On Sunday, October 11th, California Governor signed Senator Dean Florez's bill, SB 135, which prohibits tail docking of California dairy cattle.

UC Davis Students Milk Their Education for All It's Worth

Animal Science students at UC Davis are getting their share of hands-on learning about the science and practice of milk production in the class ANS124, Lactation. This class had an enrollment of 145 students in winter 2009, with an estimated 200 students taking the class in winter 2010. However, that large class size class did not stop Professor Russ Hovey from having the students embark on a demanding class project that would expose students to some of the hard work and interesting aspects of dairying.



In the first weeks of January, the students first had to get "their barn" ready. A couple of weekends saw more than 50 students painting, power washing and setting up their milking parlor and office. Their herd of 7 cows was a mix of Holsteins, a Jersey, and a Shorthorn.

In the classroom, the students learn all about the hormones and cells that change in the body and udder in preparation for lactation. Through this project they got to experience those changes and their application first hand. Of course, that included all aspects of managing the care and wellbeing of the cows morning and night by having all students contribute to chores. One unique aspect of this project, however, was that the cows started out dry, and non-pregnant - the students treated the cows with daily doses of hormones to simulate a normal pregnancy, and two weeks later started milking them. This "induced lactation" resulted in mixed success, as was expected, but within one month some cows were producing up to 18 lb. per day when milked once-daily. The students also weighed their cows, took blood samples to measure changes in the level of alpha-lactalbumin that "leaks" from the udder into the blood as lactation commences, and measured changes in udder growth from the dry to the lactating state.

All the milking was by hand, literally giving students a hands-on experience! One of the final highlights for the students was to present their project and efforts at the annual UC Davis Picnic Day, where they challenged Russ to a no-rules milking contest.

Interested in helping our students? In the current budget climate we are facing some real challenges to conduct this project in the future. If there are any producers who might be interested in **lending or donating**

dry cows for this project, Russ would enjoy the chat. He can be reached at 530-752-1682, or by email at rchovey@ucdavis.edu.

What is Required to Do Good Dairy Nutrient Management?

*Larry Schwankl, Irrigation Specialist, Carol Frate, Farm Advisor, and
Deanne Meyer, Waste Management Specialist, UCCE*

It is easy to get lost in the details of managing the nutrients on a dairy. That's why it's so important to understand the big picture of what we are trying to achieve. The overall nutrient management objective established in the General Order for Existing Milk Cow Dairies (General Order), by the Central Valley Regional Water Quality Control Board, is to apply no more than 140% of the nitrogen removed in the crop.

Two major forms of nitrogen are in manure water as it leaves the pond(s): ammonium and organic. Neither of these nitrogen forms will leach during the irrigation event in which they are applied. After the irrigation event, the ammonium nitrogen in the soil will be converted to nitrate in a matter of days (during warm weather). Change in the organic nitrogen form is slower as it must be mineralized to ammonium and then converted to nitrate. Nitrate moves readily with water through soil, so all nitrate present in the root zone at each irrigation is susceptible to being moved below the root zone (leached) when over-irrigation occurs and water drains below the root zone. Nitrate leached below the root zone cannot be used by the plant as a fertilizer, and it has the potential to contaminate groundwater.

There are two irrigation scenarios that may occur. First, when good irrigation water management occurs, the amount of water applied is close to that required to refill the crop's root zone and minimal drainage or deep percolation is generated. Drainage or deep percolation will not occur as long as the applied irrigation water is held in the crop's root zone. With good irrigation practices, it is important to apply the correct amount of nitrogen to supply the crop's needs and to meet the General Order's 140% nitrogen application criteria.

Second, if irrigation practices do result in drainage past the crop's root zone, nitrogen must be applied carefully so that **nitrate** is not present in the root zone when drainage occurs. This requires that only enough nitrogen be applied at each irrigation to meet the crop's needs until the next irrigation event. It's important that the nitrogen also be in a form plants can use. Nitrogen available to the plant is the ammonium nitrogen from the recent irrigation event (either "as is" or as the quickly converted nitrate form), and a portion of the organic nitrogen that has been converted to ammonium or nitrate nitrogen. Precise and careful nitrogen applications are needed to match application form and timing with crop nutrient needs.

Both of these irrigation scenarios require that you:

1. **Know the nutrient content of the manure water.** Manure water samples will need to be tested and data incorporated into determining application rates.
2. **Know the flow rate of manure water application.** A reliable, easy to use flow measurement method, such as a flow meter, will need to be in place.
3. **Know the nutrient content of irrigation water.** A sample of the irrigation water will need to be tested.
4. **Know how much irrigation water is applied.** Reliable flow measurement methods need to be in place. For example, propeller flow meters on freshwater pump discharges provide good information, or your irrigation district may be able to provide good flow measurement information for water they supply.
5. **Know how much water the crop needs and when it needs it.** Use a reliable irrigation scheduling method, such as Evapotranspiration (ET) scheduling to determine how much irrigation water is required.
6. **Know how much nitrogen the crop needs and when it needs it.**

It is very important to have your flow measurement infrastructure (e.g. flow meters) in place and the procedure (who is going to read them and when they will be read) for using them worked out before the hectic irrigation season begins. You need to make sure the flow meter readings get recorded in a safe place where they can be found later. The data will be useful as you schedule nutrient applications. It will also be required to complete your annual report to the Central Valley Regional Water Quality Control Board.

CDQAP: Rainy Season Reminders

Deanne Meyer, UCCE - Livestock Waste Management Specialist

Waste Storage Area Inspection (MRP-Table 1) - Weekly OCT 1st to MAY 31st, and monthly JUN 1st and SEP 30th. Inspect all waste storage areas and note any conditions or changes that could result in discharges to surface water and/or from property under control of the Discharger. Note whether freeboard within each liquid storage structure is less than, equal to, or greater than the minimum required (two feet for above ground ponds and one foot for below ground ponds). As a reminder, a template was prepared to assist operators in meeting the monitoring requirements. It is available at <http://www.cdqa.org/binder.asp>. Scroll down to section 6. Document 1 is the production area monitoring template.

The template also provides you with the reporting requirements needed during and after each significant storm event. A significant storm event is defined as a storm event that results in continuous runoff of storm water for a minimum of one hour, or intermittent runoff for a minimum of three hours in a 12-hour period. The required monitoring (and record keeping) includes visual inspections of storm water containment structures for discharge, freeboard, berm integrity, cracking, slumping, erosion, excess vegetation, animal burrows, and seepage.

Storm Water Discharge Sampling (MRP-Table 3): Another monitoring requirement that is easily missed is the need to **sample storm water discharges to surface water from fields** (land application area). Land associated with dairies cannot be covered under the irrigated lands waiver. Therefore, the General Order requires that end-of-field sampling and reporting be done for **two storm water discharges to surface water on approximately one-third of your acreage each year**. [At the end of three years, you would have sampled all fields that have storm water runoff]. If storm water leaves your property and is able to reach surface water, this applies to your fields. This runoff is associated with a significant storm water discharge (continuous storm water runoff for a minimum of one hour, or intermittent storm water runoff for a minimum of three hours in a 12-hour period). The first sampling event is the first significant storm of the wet season. The second sampling event is during the peak storm season. The General Order further identifies peak storm season to occur typically in February, and that the event is preceded by at least three days of dry weather. Samples shall be taken during the first hour of the discharge. Both data and a sample are required. The data needed include the date, time, approximate volume, duration, location, and ultimate destination of the discharge. Three different bottles will be collected. The first should be used for measuring field measurements of the discharge for electrical conductivity, temperature, pH, total ammonia-nitrogen, and unionized ammonia-nitrogen. (Record all this information. You'll need it in your annual report). The next two bottles should be collected and taken to an ELAP accredited laboratory for wastewater analysis. Analyses to request include: nitrate-nitrogen, phosphorus, turbidity, and total and fecal coliform. One land application area shall be sampled for Dischargers that have one to three land application areas; two land application areas shall be sampled for Dischargers that have four to six land application areas, etc.

For nitrates and phosphorus use bottles of 250 mL-1L. For fecal coliform analyses use a 100mL sterile bottle with preservative. Send samples to the lab ASAP. Coliforms should be analyzed 6 h after taking the sample.

“Check out our new web face”

WDR reference binder documents are still available on the WDR reference binder link <http://www.cdqa.org/binder.asp>.

WDR fall classes:

Tulare, Nov 3 rd , Dec 3 rd	Orland, Nov 9 th
Stockton, Nov 19 th , Dec 5 th	Riverdale, Nov 18 th
Merced, Nov 17 th	Modesto, Nov 5 th

Thinking about getting certified? CDQAP has been doing on-farm evaluations for certification with the updated checklist since July 1, 2009. Several dairies have been certified and will now receive a 50% savings in their annual water quality permit fees. Certification is a three step process:

Step 1: Education (2 hours of air quality & 6 hours of water quality)

Step 2: On-farm planning

Step 3: Independent, on-farm evaluation. Schedule an evaluation at: 530- 574-0524.

For more information contact your local UCCE dairy advisor or trade association representative.

Are Mycotoxins Affecting Your Herd?

Jessica Lawrence, M.S. Student, CSU Fresno, Animal Science and Ag Education

Mycotoxins are poisonous substances produced by molds. Mycotoxins can be produced in feedstuffs while growing in the field and/or while in storage. Ingestion of mycotoxins may result in a condition referred to as mycotoxicosis. Mycotoxicosis can result from a single, large dose of mycotoxin or a consistent low dose consumed over time. Common symptoms of mycotoxicosis include any or all of the following: reproductive problems, low dry matter intake, lameness, diarrhea, low milk production, higher incidence of mastitis, high somatic cell counts, etc. Several hundred mycotoxins have been identified; however, less than ten have been studied extensively since the early 1960s. The actual number of mycotoxins in animal feedstuffs remains unknown, as new toxins and their associated effects are still being discovered.

My Master's degree research project will look at 5 mycotoxins: Aflatoxin, Zearalenone, Vomitoxin, PR Toxin, and T-2 Toxin, in order to determine the effects of mycotoxins on the health and performance of dairy cows. The project will include up to 60 case study dairies, with data collected over a 60 day time period. In addition, 3 trial dairies will be studied in a blinded, side by side, 120 day trial. Data collected will be used to determine the effects of mycotoxins on the health and performance of the cow.

If you or your nutritionist feels that you may have a mycotoxin problem, and you are interested in participating in this research project, please email me at jlawrence@alltech.com or call me at (559) 786-9319.

2009 Western Alfalfa and Forage Symposium December 2 – 4, Reno, NV

Focus: "Improving Your Odds of Profitability"

Sponsored by: The Western Cooperative Extension Services.

New: A hands-on diagnostic workshop. PCA and CCA continuing education credits will be offered, and a commercial exhibit area will feature equipment, seed, support products and service information. The fee for the diagnostic workshop is \$50.

To register: Please visit <http://alfalfa.ucdavis.edu>.

2010 World Ag Expo Forage Challenge February 9 - 11, Tulare, CA

Farmers and ranchers from 11 western states - AZ, CA, CO, ID, MT, NV, NM, OR, UT, WA and WY -- are invited to enter the 2010 World Ag Expo Forage Challenge by **submitting samples from their bales or silos to the University of California-Davis**. Entries will be judged in three categories: alfalfa hay, standard corn silage and brown mid-rib (BMR) corn silage. **Cash prizes** will be awarded based on forage lab analyses, along with a visual evaluation of the entries. More information can be found at: www.worldagexpo.com/General-Info/Forage-Challenge.htm

California Dairy Newsletter

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Carol Collar, Farm Advisor



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