Who is smarter, me or my computer?

by Steve Martin

As a college undergraduate I took a couple of classes out of order – and I often wonder if it ended up being a big part of my future career path.

I signed up for a feedlot management course that was heavy in nutrition and was taught by a professor that had come back to academics from industry. His industry savvy had a big impact on me.

That class was a junior/senior level offering, and an obvious prerequisite would have been the sophomore Introduction to Feeds and Feeding class. The lower lever class covered a general understanding of various feed ingredients and how to blend them into diets. It was fairly basic and the math was done by hand. There were equations that looked a lot like my early high school child's homework, with a lot of solving for "X".

I remember thinking, "I didn't major in Animal Science to re-learn 9th grade algebra," and "Couldn't I just skip that class?" I didn't get to do that, but I did delay it.

I signed up for, and due to some oversight, ended up in the more advanced class first. Due to this, I ended up learning to balance rations on the computer in a program called Mix-It before I learned to do them by hand.

Feeding real cattle

In that class the professor taught using real diets from some of his outside consulting work. These weren't just textbook examples for training; we were actually feeding real cattle! And I was hooked.

Now move ahead 30 years and change the animals from feedlot beefers to sleek dairy cows. I am still using principles every day that I learned in that class.

The common denominator between then and now is ration software and the general principles that allow us to take various feed ingredients and blend them together to meet some set of animal requirements. The software packages are different now and are more complex. Nutrient requirements have been fine-tuned over the years. The love of the process, though, is still the same.

There are two main ways to use ration formulation software. First, you can enter a ration and the program will tell you the nutrient levels and how much milk or weight gain it should support. You can then "tweak" ingredient feeding rates to either support more milk or weight gain, or perhaps to find cost savings. This process could be called "calculating" diets.

This trial and error approach can allow you to make intuitive directional changes and indicate if you have accomplished what you hoped to do. The limitation, however, is that the computer can't be any smarter than the user. There is a better way; a method that was required by my nutrition professor.

In addition to ration software being a giant matrix with rows of feed ingredients and columns of nutrient values, there is something involved called linear programming (LP). LP is the part that can be smarter than the person behind the keyboard.

LP is not smarter at understanding things like TMR moisture, forage length, and what a nice manure pile looks like. But it is smarter at math. And faster, too. LP takes your trial and error approach and evaluates a few thousand solutions in a couple of seconds. That is impressive. Why, then, are many ration formulators scared of this step that results in the least-cost solution?

The term "least-cost" developed a bad reputation as LP solutions began to make their way into feed bunks in the real world. I am certain that more than just a few dairy producers have said with great passion, "I don't want any least-cost rations feeding my cows". How did such a powerful nutrition and economic tool stumble badly right out of the gate?

With the benefit of 20:20 hindsight vision, we might have forgotten what the computer did best and what we as nutritionists did best. The question is, should we simply dismiss these LP least-cost solutions or can we use this great tool with an abundance of caution?

There was an effort by some to market their way out of this bad reputation. Terms such as "best value" formulations were coined to divert attention away from earlier shortcomings. That term is actually a pretty good one and it describes the approach aptly. The best description for me would be calling this approach a high level interaction of biology and economics.

The computer knows the nutrient content of the ingredients and we improve that information by updating it with actual lab analysis and current cost. If I use the ability of the computer to look for the cheapest way to meet the requirements I set, the result will usually be several cents lower in cost than my very best efforts via the tweaking trial and error approach.

Using the LP part of the software has a trial and error feel to it as well. But this is a more qualified process because you evaluate suggestions by the "smarter than you" computer and settle on the one that fits best.

It could be that you have in place a nutrient restriction that is a bit tighter than it really needs to be. Most programs tell you where the stress in the math is. At times, loosening that restriction slightly can really open up the ration and the solution could be noticeably cheaper and just as useful to feed cows.

I will occasionally offer an opinion on an ingredient value question from a client based on my gut feel. Then, when verifying that quick answer with the formulation model, I see my first thought was not right. I call the client back, apologize a little and make the point that there is a reason we don't do this math in our head.

As long as you have the right information in the user inputs, the computer truly does know best. It just needs the filter of a nutritionist with good cow sense to be sure the math meets the real world.

To illustrate this, I have included a ration comparison. In the right hand column labeled "current" I did my best to input a logical diet that meets the nutrient needs of a Holstein cow making approximately 90 pounds of milk per day.

In this process, I chose the levels of corn silage, alfalfa and straw that might be common. Then I increased energy and protein in the diet using corn, soybean meal and cottonseed, along with other grains and byproducts. These are all common feeding rates for these ingredients.

The ration on the left labeled "suggested" is one where I set the requirements for energy, protein and roughage nutrients to match the current ration, and with the price inputs in place I let the computer's LP meet the same set of nutrients.

The computer did better

I gave the computer a modest range up or down from mine for each ingredient, so as to not allow it to drastically change the ration. Both rations support the same milk production and rumen health considerations. The computer LP attempted many solutions nearly instantaneously and picked the cheapest one.

It beat mine by seven cents, which on a 2,500-cow dairy results in almost $64,000 of feed cost savings per year. Not too shabby. And I didn't let the computer "take over the whole farm" by using its LP function.

It takes some work to keep all of my currently-fed diets in the LP mode, but it is a worthy effort. If the phone rings with a quick question on an ingredient value, the computer helps with a quick answer.

In this environment, ongoing work on a particular ration helps to insure that potential ingredient changes will support the same milk production results. It also takes my bias – but not my experience – out of the driver's seat.

When I look back on that class at Auburn, I now understand that learning this technique early in my education gained a comfort level that is still in place. And how much has using LP saved my clients over the past 24 years? If I have formulated diets for an average of 25,000 cows per year and saved that same seven cents, then the total feed cost savings is over $15 million.

Using a thoughtful LP approach in ration formulation is an important way to be sure were are truly feeding for the bottom line. *WEST*

Amounts Per Day | Dry | Feasible | Balanced

Code	Mix Code	Name	Suggested Ration	Ingr Type	Current Ration	Price per TON
17H		CORNSIL 33St	15.00	1	16.00	$63.00
6		ALF SIL 22CP	5.50	2	5.00	$70.00
58		FLAKED CORN	12.62	2	12.50	$180.00
44		WET BREWERS	3.25	2	2.50	$50.00
3		ALF HAY #2	5.41	2	5.00	$165.00
39		CANOLA MEAL	3.50	25	2.00	$260.00
48		COTTONSEED	3.25	2	4.25	$325.00
140428HM		LACT MIN SUP	2.50	2	2.50	$550.00
DNMC40		DDG	1.88	2	2.00	$199.00
53		SOYBEAN MEAL	1.26	2	2.25	$385.00
27		WHEAT STRAW	.50	2	.75	$75.00
71		FAT SUPPL	.33	15	.25	1,200.00
						$0.00
Target DM Intake: < 55.0000 >			107.17 AF		105.87 AF	
Sugg Cost/Hd/Day: $6.60			55.00 DM		55.00 DM	
Curr Cost/Hd/Day: $6.67						