The Field needs to know: how to attempt to balance risk assessment tensions: managing for N vs. P, Air vs. Water, field edge vs. watershed, mediated by Karl Czymmek, Pro Dairy.

See: http://www.inmpwt.cce.cornell.edu/documents/PP% 5_4_04 Czymmek.pdf

Trade-offs
- CAFO regulations require a decrease in nutrients use.
- Under current water quality standards, practices that have a visual impact on water can result in fines. Can our guidelines prevent this level of runoff/leaching?

The Problem
- Economically optimal stocking rate in NE is ~ 1 acre per milking cow + replacement (2 AU/acre).
- Each ton of manure has about 10 lb N and 4 lb P that = 350-400 lb N and 150 lb per cow & replacement (as excreted) per year.
- NYS soil test P – in 1958, 26% of soils tested high and very high; in 1995-2001, almost 50% testing high and very high.

Air quality concerns
- Ammonia emissions: tradeoff between surface application and volatilization vs. incorporation / injection and possible leaching. Greenhouse gas concerns. Odor / neighbor relations.
- Solution: incorporate manure.
- Challenge: farm N balance, leaching.

Surface Water
- Concern: P runoff.
- Solution: storage/timing, incorporation, spread farther from water.
- Challenge: ground water contamination, erosion, risk of big slugs of manure application.

Groundwater / wells
- Concern: N leaching.
- Solution: Surface application, reduce application rates, timing/storage.
- Challenge: air emissions, odors, individual well vs aquifer.
  - Can’t meet drinking water criteria (10 ppm) under corn on well drained soils (11.8 to 22.4 ppm) (Van Es data). Must relay on dilution. N leaching into groundwater
during fall rains after dry summer. Grass had less leaching (Van Es, 1 to 6.3 ppm), but 300 lb N release when sod is killed. At Willsboro, N went from 2 to 20 ppm on clay loam when alf. sod was plowed down.

Can we achieve a balance?
Risk indicies.
Source reduction – precision feeding and forage management.

Discussion
Treatment / Export?
- Must optimize biology and export what’s left.
- Many farms are exporting manure now, the ultimate solution will be to treat and export.
- No magic bullet in engineering (treatment/ export) approach. Currently treatment is too costly, 3X cost of land application.
- Selling “green” composted manure has marketing and transportation problems. Economies of scale is a problem. No one dairy has enough manure to efficiently compost and market. Consortiums are being created. Syn-a-grow is an example.
- Compost manufacturing has logistics problems:
  - Carbon must be added.
  - Large time and management commitment.
- Even with a digester, still have to handle solids.
  - What is feasibility of products other than compost? Grass biomass production?

What on-farm reductions are possible / practical?
- As farmers do a better job growing feed, need less acres/cows, imbalance gets worse.
- There are short and long term issues. Short term issue – improve farm efficiency and will improve nutrient balance. Long term – need structural industry change.

Cost of limiting excess nutrient balances
- Dairy economics don’t support extensive production (more crop acres/cow). Forage provides $2,000-$3,000 milk production /acre. Grain production averages $500 milk production /acre. It is more cost effective to buy grain. Shortage of land and labor also limit grain production.
- Many farms have already reduced excess nutrients 15-20% but that leaves 80-85%.
- What is economic threshold? How low can we push mass balance and still have a positive return? Use economic engineering to construct representative farm with zero fertilizer and minimum purchased feeds. How would farm be organized?

What guidelines do we give producers?
- Guidelines are increasingly signaling storage. EZ Acres as case study. Now they are daily spread and water quality is good. Should they spend $$$ for storage and then take on risk of spreading over a few weeks in April and Fall?

Knowledge Gaps -Dave Bouldin: The big “unknowns” are:
- Alfalfa N fixation;
- Denitrification;
- Turf fertilization and
- Sewage disposal.
(Bob Howarth) Biggest uncertainty in N budgets is N fixation. Currently a national denitrification workshop is taking place.

**North American Nitrogen Center – Bob**

- 1/3 coastal waters are seriously degraded. N2O is green house gas with longest half life. 10 ppm standard for groundwater is too high and will probably be pushed down. Health concerns may start at 2 ppm.
- Benefit of cropping system in carbon sequestration.

**Changing attitudes / education**

- A problem is our reductionist approach – need multidisciplinary, ecologist type approach.
- There are solutions available but a cultural change is needed. Farmers are more professional today than in the past. Process takes time. Planning winter meetings now to discuss Chesapeake Bay Project. Producers need to understand what is coming and make plans. A Upper Susq. Coalition member is now in each affected county and has been provided with presentation materials.
- NRAES is sponsoring a conference in 2005 focusing on manure and waste management technology.

**Next meetings:**

**May 13,** Seminar 8:15-9:45 a.m.  
Workshop 10:00 a.m. – 4:00 p.m. (registration required)  
**Topic:** Seminar & Hands-on Workshop: Water Erosion Prediction Project and it’s GIS-Based Geowepp Interface.  
**Speaker:** Chris S. Renschler, University at Buffalo (SUNY)  
**Room:** 300 Rice Hall, Cornell Campus.

**May 26, 12:00-1:30**  
**Topic:** Modeling tools for regional groundwater systems  
**Speakers:** Alan J. Rabideau, James Craig, and Shawn Matott  
Department of Civil, Structural, and Environmental Engineering University at Buffalo.  
**Room:** 133 Emerson Hall, Cornell Campus.