Received 9-28-07

Comments from Dr. Dan Jaynes, USDA National Soil Tilth Laboratory, Ames, Iowa

This report is greatly improved over earlier drafts and is a much more comprehensive review of the science and potential solutions than the earlier Integrated Assessment. The scientists involved in this effort should be congratulated on their efforts and diligence in delivering this report in the very short time allotted.

P6 l13. The Panel indicates that hypoxia in the NGOM may soon enter a “point of no return”, where “even larger nutrient reductions are required to reduce the area of hypoxia”. These statements appear to be in conflict as a ‘state of no return” implies just that, that no amount of action will reduce gulf hypoxia, while “even larger … reductions” implies that gulf hypoxia could still be reduce but with much greater effort. In fact, the Panel does not establish either of these points within the science assessment of the report. We urge the Panel to more carefully phrase their finding least phrases such as “point of no return” be taken out of context and used by those with out a clear understanding of the causes and uncertainties of gulf hypoxia.

P39 l45. Delete this paragraph as it repeats previous paragraph.

P60 l45 and caption Fig. 10. The Jaynes analysis was for row-crops and not specific to corn and soybean, although corn and soybeans would be the dominant row-crop in much of the Midwest.

P3, l15, P76-77. Much is made of the fact that the Upper MS and OH river basins contribute the majority of the nutrient fluxes (80% for total N) while representing only 32% of the MARB drainage area. This comparison while true, is misleading because the upper MS and OH river basins also contribute 71% of the total flow of the MARB and it’s flow that in great part determines flux, not area drained. Viewed in this context, the OH river basin’s contribution to nutrients is proportional to its contribution of flow (Table 3). The Upper MS contributes about 150-250% more nutrients than flow, the Missouri basin contributes about 200% more TKN and total P than flow, as does the Lower MS for total P.

P84 l1. It would potentially be of great benefit if the Panel were to elaborate on why the nitrate flux from the MO river basin has decreased so dramatically since the 1990’s. Was the decrease just from manipulations of the river’s flow regime or have land use practices within the basin driven the decreases. This “success” could have profound implications for the other MARB basins.

P86 table, bullet 2. Total P flux increased markedly from the Ohio River basin, but it was not apparently due primarily to an increase in flow (Fig. 25) as stated here.

P92 l10-24. While we agree that N balance computations are very helpful for identifying basins out of nutrient balance, these computations are of limited benefit for estimating N losses to streams. For example, NANI ignores effects of cover crops on N losses, but field studies show that cover crops greatly reduce N losses to tile drainage (apparently by building SOM). Conversely, NANI doesn't consider the priming effect observed when small amounts of added N fertilizer can cause proportionately greater N losses to tile drainage (see Cookson et al, Nutr. Cycl. Agroeco., 56:99-107 for example).

P102 l1-10. While the Panel is correct that the IPCC estimates that 0.75% of the N leached to rivers in converted to N_2O, the IPCC considered denitrification in rivers to represent only part of the fate of N leached from soils. The IPCC considered leached N to cycle through groundwater and agricultural drainage, through rivers, and then through estuaries on its path to the sea. Considering all of the N_2O losses of the N leached from soil, the IPCC estimated a mean of 2.5% of the N leached lost as N_2O, far exceeding the 0.75% just for riverine losses. Thus, the Panel's conclusion on line 10 is correct, but less N_2O is produced if N is denitrified in the soil versus leached and denitrified in drainage, rivers, and estuaries.

P141-144. The discussion on Landscape Design is interesting, but contributes little to the analysis of the causes and remedies for gulf hypoxia. The section could be deleted.

P155 and P185. The Cooke et al., 2007; Karlen et al., 2005; and Mosier et al. 1998 citations are missing from the References.

P159 & 160. The captions for fig 41 and 42 list the equations incorrectly. The -0.33 and 0.67 should be raised as exponents in the two figures respectively.

P182 l13-22. Switching from fall to spring N application may more reasonably be estimated to reduce nitrate losses to streams by 5-20% not the 15-30% used here (see Randall and Vetsch, 2004 from the Report's Reference list for example). In addition, the estimated N loss from tile drainage of 20-40 kg/ha is high compared to many observations (see Jaynes et al., 1999 under the Report's Reference list for example). An estimate closer to 10-30 kg/ha would appear more representative of the Corn Belt on average. Using these more realistic values would greatly decrease the estimated reduction of N delivered to the MARB from this switch in N fertilizer practice.

P185. l25. Actually the study by Karlen et al. 2005 is the same study, but different paper, as reported by Jaynes et al. 2004.

P189 l14. While we agree that more research is needed to examine the effect of N fertilizer rate near the optimum rate on SON and SOC and that most soil carbon studies have found little effect of near optimum N rate on SOC, the Panel has ignored two important points. First, the N imbalances computed by Jaynes et al. 2001 are of a magnitude to be below the accuracy of measurement for most SOC change studies. Second, other N mass balance studies have also concluded that loss of SON is a very likely explanation of a N mass imbalance (David et al. 2001 and fig 26 of the Panel report for example).

P195. The Panel has identified many promising management options for reducing nutrient losses to surface water. However, most of these are still experimental or not fully tested. There is little data available that quantifies the water quality impact of any of these options at a meaningful water quality scale such as a local watershed. In addition, it has not been shown how many of these practices can be fully incorporated into existing production agricultural systems. All of these practices need to be fully vetted at the watershed scale before major investment of public or private funds.

P201 l32. This statement is misleading as it is not just the transportation costs of feed stocks that are slowing cellulosic ethanol production, but also fermentation inefficiencies with current conversion processes.

P170 & 171 Fig 43 & 44. These figures appear to be inaccurate and misleading. They appear to be based on Fig. B-1 and B-2 of the original USDA-NRCS, 2003 report, in which case they should be labeled as "recoverable manure nitrogen" and "recoverable manure phosphorus", respectively. These are not "excess manure N and P" as labeled in Fig 43 and 44 of the panel report. Recoverable nutrients are those that can be incorporated into a farm nutrient management plan to meet the nutrient requirements for that farm. Excess implies that the nutrients available exceed the nutrient requirements of the farm and are thus susceptible to loss to surface waters.

P212 Table 17. Dinnes, 2004 in a survey of Midwestern studies gave a range for N reductions when switching from fall N fertilizer application to spring pre-plant of -10 – 30% with a mean of 15%. These estimates are well below the range listed here.

P217. Using inter-seeding of leguminous cover or relay cropping with corn is not a good example to use as neither of these is currently feasible due to cold temperatures in the northern half of the Corn Belt – source of much of the N to the NGOM.