

SECTION TWO

DATA AND METHODOLOGY FOR ESTIMATING COMPLIANCE COSTS AND ECONOMIC EFFECTS

This section presents the data and methodology EPA uses to estimate the total annual incremental costs and the economic impacts that would be incurred by the livestock and poultry industry as a result of the final CAFO regulations. This analysis examines potential compliance costs and financial effects on regulated CAFOs (e.g., feedlots and feedyards) as well as effects on consumer markets.

Section 2.1 identifies the regulated industry sectors and provides an overview of EPA's data and model framework using a representative "model CAFO" approach. Section 2.2 describes the methods and assumptions used to estimate annual CAFO level compliance costs (described in greater detail in other rulemaking support documents). Section 2.3 summarizes the development and characterization of EPA's financial models for each sector, incorporating changes to EPA's model and input data used for the 2001 Proposal. These models provide the basis for calculating the total annual costs of the final regulations and are used to evaluate potential financial impacts on regulated CAFOs. This section also presents the financial data that EPA assumes to depict baseline conditions and assess regulatory changes. Section 2.4 describes the financial criteria and general approach that EPA assumes to evaluate regulatory effects on model CAFOs. Section 2.5 summarizes the methodology EPA uses to assess additional market impacts, including national level changes in prices and available quantities, as well as changes in national aggregate employment and economic output.

More detail on the data and model framework that EPA uses to evaluate economic effects of the rule is provided in EPA's *Economic Analysis* supporting the 2001 Proposal (see: USEPA, 2001a, referred to as the "Proposal EA"), with updates as documented in the two Notices of Data Availability presenting new data and information EPA has received since the 2001 Proposal (see: USGAO, 2001b, 66 FR 58556, and USGAO, 2002, 67 FR 48099; referred to as the "2001 Notice" and "2002 Notice," respectively). More information on EPA's compliance cost estimates is presented in EPA's *Development Document* supporting both the proposed and final rulemaking (USEPA, 2001b; 2002).

2.1 BACKGROUND AND OVERVIEW

2.1.1 Overview of Analytical Framework

As discussed in greater detail in the Proposal EA, EPA estimates incremental costs and regulatory impacts using a representative farm approach. For this analysis, EPA developed "model CAFOs" for each sector to assess the average costs and economic impacts of the revised regulations across differently sized, differently managed, and geographically distinct operations.

A representative farm approach is consistent with past research conducted by USDA and the land grant universities and their affiliated research organizations, including the Food and Agricultural Policy Research Institute (FAPRI), the Center for Agriculture and Rural Development (CARD), Texas A&M's Agriculture and Food Policy Center, the Texas Institute for Applied Environmental Research (TIAER), and the University of Missouri's Commercial Agriculture Program. These organizations and others have

widely adopted the representative farm approach to assess a broad range of policy issues, including changes in Federal agricultural policy and pricing programs, domestic food programs, environmental legislation, and international trade. This approach has been used to assess agricultural market changes for both livestock and crop commodities, as well as to evaluate the financial impact of implementing management measures and installing animal waste systems at livestock and poultry operations. More detailed information is provided in Section 4 of the Proposal EA. Since proposal, EPA has also conducted an in-depth literature review of the types of approaches used in the academic community to assess the economic effects of public policy on agricultural operations, which further validates use of this approach. This review is available in the rulemaking record (DPRA, 2001).

A representative approach provides a means to assess average impacts across numerous facilities by grouping facilities into broader categories to account for the multitude of differences among animal confinement operations. This approach allows a means to account for differences in performance among farming operations.

Using a representative farm approach, EPA constructs a series of model facilities that reflect the Agency's estimated compliance costs and available financial data. EPA uses these model CAFOs to develop an average characterization for a group of operations (described in Section 2.3 of this report). From these models, EPA estimates total annualized compliance costs by aggregating the average facility costs across all operations that are identified for a representative group. As with EPA's cost models, its financial models are grouped according to certain distinguishing characteristics for each sector, such as facility size and production region, that might be shared across a broad range of facilities. Economic impacts under a post-regulatory scenario are approximated by extrapolating the average impacts for a given model CAFO across the larger number of operations that share similar production characteristics and are identified by that CAFO model. EPA compares its estimated compliance costs at select model CAFOs to corresponding financial conditions at these model facilities (discussed in Section 2.4). Follow-up analysis assesses the broader market level effects of the final regulations (Section 2.5).

As detailed in the Proposal EA and in EPA's record, EPA presented its proposed methodological approach to USDA personnel and to researchers at various land grant universities for informal review and feedback at various stages in the development of these regulations.

2.1.2 Overview of Sources of Data

EPA has undertaken an expedited approach to this rulemaking effort and did not conduct an industry-wide survey of all CAFOs using a Clean Water Act Section 308 questionnaire. This decision is described in the 2001 Proposal (66 FR 3079) and detailed in the Proposal EA. EPA is relying on existing data sources and expertise provided by numerous government agencies, state agricultural extension agencies, land grant universities, industry trade associations, and agricultural professionals. Major data sources are discussed in detail where they are used to conduct the analyses presented in this report or reference other supporting documents in the rulemaking record.

The majority of the data EPA used to support development of the final CAFO regulations are from existing sources. As defined in the Office of Water 2002 Quality Management Plan, which is provided as part of the *Development Document* (USEPA 2002), existing (or secondary) data are data that were not directly generated by EPA to support the decision at hand.

In keeping with the graded approach to quality management embodied in the quality management plan, EPA must assess the quality of existing data relative to their intended use. The procedures EPA used to assess existing data for use in developing effluent guideline limitations for CAFOs varied with the specific type of data. In general, EPA's assessment included:

- Reviewing a description of the existing data that explains how the data were collected or produced (e.g., who collected the data, what data were collected; why were the data originally collected; when were the data collected; how were they collected; are the data part of a long-term collection effort, or was this a one-time effort; who else uses the data; what level of review by others have the data undergone, etc.)
- Specifying the intended use of the existing data relative to the CAFO final rule
- Developing a rationale for accepting data from this source, either as a set of acceptance criteria, or as a narrative discussion
- Describing any known limitations with the data and their impact on EPA's use of the data.

Brief descriptions of the data and their limitations are presented later in this document, as each data source is introduced.

In searching for existing data sources and determining their acceptability, EPA generally used a hierarchical approach designed to identify and utilize data with the broadest representation of the industry sector of interest. EPA began by searching for national-level data from surveys and studies by USDA and other federal agencies. When survey or study data do not exist, EPA considered other types of data from federal agencies.

Where national data do not exist, as the second tier, EPA searched for data from land grant universities. Such data are often local or regional in nature. EPA assessed the representativeness of the data relative to a national scale before deciding to use the data. When such data came from published sources, EPA gave greater consideration to publications in peer-reviewed professional journals compared to trade publications that do not have a formal review process.

The third tier was data supplied by industry. Prior to proposal, EPA requested data from a variety of industry sources, including trade associations and large producers. The level of review applied to data supplied by industry depended on the level of supporting detail that was provided. For example, if the industry supplied background information regarding how the data were collected, such as the number of respondents and the total number of potential respondents, EPA reviewed the results, compared them to data from other potential sources to determine their suitability for use in this rulemaking. If the data provided by industry originated from an identifiable non-industry source (e.g., a state government agency), EPA reviewed the original source before determining the acceptability of the data. In a limited number of instances, EPA conducted site visits to substantiate information supplied by industry. In contrast, data supplied by industry without any background information were given much less weight and generally were not used by EPA. Further, some data that were supplied by industry prior to the proposal were included in the proposal for comment. In the absence of any negative comments, such data were relied on to a greater extent than data submitted by industry during the comment period itself.

For its engineering cost analysis, EPA uses industry and cost information from various sources, including USDA, the land grant universities, state agricultural extension agencies, and industry. EPA uses these data to develop its model CAFOs and to extrapolate CAFO level costs to all operations nationwide. A key source of data used to estimate compliance costs and economic impacts on the regulated community is the 1997 Census of Agriculture. The Census is conducted by the National Agricultural Statistical Service (NASS) every five years. It provides information on the number of feedlots, their geographic distributions, the amount of cropland available to land apply animal manure generated from animal confinement operations, and other information. NASS compiles these data, with the assistance of personnel at USDA's Natural Resources Conservation Service (NRCS) who developed a methodology to identify information specific to animal confinement operations. All Census data provided to other government agencies, including EPA, are aggregated to preserve confidential business information. As detailed in the 2001 Notice, EPA has received additional data and information since proposal that have been incorporated into its analysis for the final regulations. EPA's *Development Document* supporting the proposed and final rule (USEPA, 2001, 2002) presents the Census data used along with other USDA data and other source data that EPA uses for its cost analysis.

For the economic impact analysis, EPA obtained financial data for livestock and poultry operations from a variety of sources, including USDA, the land grant universities, and industry. EPA uses these data to depict baseline financial conditions at representative model CAFOs and to extrapolate CAFO level impacts to all operations nationwide. As detailed in both the 2001 Notice and the 2002 Notice, EPA received additional data and information since proposal that have been incorporated into the analysis for the final regulations. To assess broader market changes from the CAFO regulations, EPA compiled additional industry and market data from a wide range of USDA data and land grant university research. A detailed summary of the data and citations of the sources of the data are provided in the Proposal EA, supplemented by data and other information presented in this report.

A key source of financial data is USDA's Agricultural Resource Management Study (ARMS). This study is compiled by NASS and USDA's Economic Research Service (ERS) and provides complete financial accounting data for U.S. farms for each of the major commodity sectors affected by the final CAFO regulations. These data are used to depict farm financial conditions and to evaluate regulatory impacts. ERS obtained data for representative farms through special tabulations of the ARMS data, conducted by ERS, that differentiate the financial conditions among operations by commodity sector, facility size (number of animals on site), and major farm producing region. As with the Census data, USDA aggregates these data in a manner to preserve both the statistical representativeness and confidentiality of the respondent survey data. EPA also obtained financial data from various land grant universities, including enterprise budgets that portray financial conditions for an operation's livestock or poultry enterprise. In particular, the University of Missouri's Food and Agricultural Policy Research Institute (FAPRI) submitted financial data for several sectors that were collected as part of its evaluation of EPA's Proposal EA. EPA also obtained financial data from the National Cattlemen's Beef Association (NCBA) based on a survey of its membership to obtain financial statistics specific to cattle feeding operations. Section 2.3 and other sections of this report discuss these data in more detail and describe how these data sources contribute to EPA's analyses.

2.1.3 Overview of EPA's Economic Model (2001 Proposal)

For the proposed rulemaking, EPA developed an economic model to assess financial impacts on regulated CAFOs based on predicted changes to select financial criteria. This approach is documented in

the 2001 Proposal (66 FR 3079-3103) and the Proposal EA (USEPA, 2001a). Additional information is available in the *Development Document* supporting the regulations (USEPA, 2001b, 2002).

To assess regulatory impacts on CAFOs, EPA developed an economic model to assess financial effects based on predicted changes to select financial criteria. This model consists of a series of representative model CAFOs that EPA used to evaluate estimated compliance costs against assumed baseline financial conditions. EPA evaluated the economic achievability of the proposed regulatory options at existing operations based on changes in representative financial conditions across three financial criteria: (1) an initial screening comparing incremental pre-tax costs to total gross revenue (“sales test”), (2) projected post-compliance cash flow over a 10-year period (“discounted cash flow analysis”), and (3) an assessment of an operation’s debt-asset ratio under a post-compliance scenario (“debt-asset test”). These criteria were evaluated using 1997 data from USDA reflecting financial conditions at the whole-farm level (i.e., reflecting income and cost information spanning an operation’s primary livestock production, as well as secondary livestock and crop production, government payments, and other farm-related income). Based on estimated changes to these select criteria, EPA divided the impacts of the proposed regulations into three financial impact categories: Affordable, Moderate, and Stress. Operations experiencing affordable or moderate impacts are considered to experience some financial impact on operations at the affected CAFOs, but EPA does not consider these operations to be vulnerable to closure as a result of compliance. Operations experiencing financial stress impacts are considered to be vulnerable to closure post-compliance. Section 4 of the Proposal EA provides more information about EPA’s justification for using this approach and the assumptions in the model.

To assess economic effects on national markets, EPA used an approach adapted from a model developed by ERS to evaluate various policy scenarios in terms of changes in farm and retail prices and product quantities. Once price and quantity changes were predicted by the model, EPA used national multipliers that relate changes in sales to changes in total direct and indirect employment and also to national economic output. The approach and data used for this analysis are described in Section 4 and Appendix B of the Proposal EA.

2.1.4 Overview of Changes to EPA’s Economic Model (Final Rule)

As detailed in the 2001 Notice (see 66 FR 58577-58591), EPA received many public comments on its economic analysis regarding the appropriateness of the financial data and the assessment criteria used for the analysis, as well as other aspects of EPA’s model. The 2001 Notice details the major comments received on EPA’s proposal, including recommendations that EPA (1) expand the range of cost estimates per representative farm to account for variability across operations (based on expected capital and management improvements needed); (2) add assessment criteria to measure changes in net farm income (profits) in addition to criteria considered in the analysis; (3) consider financial data to depict baseline conditions that consider revenue from an operation’s livestock or poultry enterprise level only, rather than consider income available to an operation from all enterprises at that operation (“farm level” data); (4) revise the baseline data and the criteria threshold used to analyze the debt-asset test (which would reflect higher baseline debt levels in industry); (5) consider debt feasibility to evaluate an operation’s ability to incur new debt; and (7) consider other available financial data for multiple years to supplement EPA’s analysis based on a single year of data. Other comments include recommendations on EPA’s assumptions on cost offsets, such as income from manure sales and cost-sharing and technical assistance. Additional information is presented in the 2002 Notice (see 67 FR 48110-48105).

Both Notices describe ways in which EPA would address these concerns and also present alternative financial data that the Agency is considering to perform its analysis. Comments received by EPA from industry and the land grant universities on both Notices largely support these efforts and provide additional recommendations. However, EPA also received comments that challenge the methodological changes presented in the 2001 Notice. These comments claim that EPA failed to consider societal costs and industry impacts accounting for various cost offsets, including cost savings of converting from confined to pasture-based systems as well as cost passthrough from farm to processor. See Waterkeepers Alliance, et al. (2001) and Sierra Club (2001), and other supporting comments (Ikerd, 2001; Weida, 2001).

The EA supporting the final regulations retains the general modeling framework that the Agency used to assess economic effects for the 2001 Proposal, with the modifications discussed in both EPA Notices. Section 2.3 of this report presents financial data that EPA uses for its final analysis. Section 2.4 describes changes to the approach EPA uses to assess financial effects to CAFOs.

2.2 ESTIMATES OF ANNUAL COMPLIANCE COSTS

2.2.1 Development of Representative Model CAFOs

To evaluate regulatory impacts on CAFOs, EPA has developed a series of model CAFOs to conform to a representative farm approach. This approach consists of two major modeling components: cost models and financial models. This section describes EPA's cost models; Section 2.3 describes EPA's financial models. Section 4 of the Proposal EA provides additional information on the development and interface of the cost and financial models.

Model CAFOs developed for EPA's analysis reflect average conditions for selected groups of livestock and poultry operations. Three factors are recognized to affect the way CAFOs operate: (1) commodity sector (beef, veal, heifers, dairy, hogs, broilers, layers, turkeys); (2) farm production region; and (3) facility size (based on herd or flock size or the number of animals on site). EPA's cost models and financial models are therefore differentiated by sector, select region, and size group.

The CAFO models EPA uses for this analysis represent the interface between a large number of cost models and a smaller number of financial models. Fewer financial models are developed because of data availability issues (as discussed in detail in Section 4 of the Proposal EA). The cost models are able to account for greater variability among operations, as compared to the financial models. This variability includes differences in production types, geographic conditions and production region, land availability, technology needs, and so forth. For example, EPA is able to account for individual costs to veal and heifer operations; however, financial data are not available for these individual sectors. Data are available to reflect cost differences between egg-laying operations that use liquid manure management systems and dry systems, but financial data do not capture these differences in cost and returns. The cost models can account for the type of animal production facility, the availability of cropland and pastureland to land apply manure nutrients, farmland geography, and existing state regulatory requirements. They can also reflect cost differences within sectors based on manure composition, bedding use, and process water volumes. For more detailed information, refer to the *Development Document* (USEPA, 2002). As discussed in Section 2.4, however, the financial models are able to account for certain other factors, such as business type and legal structure, which could affect an assessment of whether an operation is able to afford the estimated cost of compliance.

For its cost analysis, EPA has developed representative models that account for variability among the different types of operations, accounting for differences based on available cropland for manure application, differences by production region and by facility type, and an operation's current manure management practices and technology needs. As described in more detail in the *Development Document* (USEPA, 2002), estimated compliance costs distinguish between three categories of land availability: Category 1 CAFOs (sufficient cropland for all manure nutrients generated), Category 2 CAFOs (insufficient cropland), and Category 3 CAFOs (no cropland). EPA's estimated costs also distinguish between three categories of technology needs based on the types of manure management practices already in place: "Average Needs" (assumed for 50 percent of all operations), and "Least Needs" and "Most Needs" (assumed to account for 25 percent each of all operations). In addition, EPA's cost models account for production area differences in costs that are critical to an assessment of incremental compliance costs. See Section 2.2.3 of this report.

EPA's cost models aggregate USDA's regions into five broad production regions for the purposes of estimating costs: Midwest (MW); Central (CE); Pacific (PA); Mid-Atlantic (MA); and South (SO) (see USEPA, 2002). The financial models, however, are not distinguishable by this many regions because available financial data do not allow for aggregation at this level of detail. Where financial data are not available by region, national data are used. To match up with fewer regional models in the financial analysis, EPA collapses the total number of regions evaluated in some cases. To do this, estimated number of CAFOs in regions other than the major production regions are allocated to the major regions on an equally weighted basis. That is, within each sector, 50 percent of CAFOs in regions other than the two primary production regions are assigned to one major production region and the other 50 percent are assigned to the other.

Finally, EPA's cost models are developed across a broad range of facility size groups, including CAFOs with more than 1,000 AU² (Large 1 and Large 2 CAFOs) and operations with between 300 AU and 1,000 AU (Medium 1, 2, and 3 model CAFOs). Facility size categories vary by sector; the average number of animals represented by each model CAFO is based on typical inventory estimates that are common for that size range in a particular sector. Data limitations restrict the number of facility size categories available for EPA's financial models. In some cases, available financial data generally cover operations with more than 1,000 AU and operations with fewer than 1,000 AU. In cases where available data do not match this size breakout, EPA uses national average data. Because the cost and financial models are both expressed in terms of per-animal (inventory) basis, this approach allows EPA to link the available data on baseline financial conditions to estimated compliance costs across representative CAFOs, thus capturing differences in facility size. See the discussion in Section 2.4.

Table 2-1 shows the range of facility sizes and the average number of animals associated with each size range that EPA assumes for each model CAFO. See the *Development Document* (USEPA, 2002) for more information on the development of the model sizes shown in the table.

2.2.2 Compliance Assumption Under Existing Regulations

For the 2001 Proposal, EPA estimated only the costs of the new requirements attributable to the proposed regulations. All operations with more than 1,000 AU that are defined as CAFOs by the existing

² As defined for the final regulations, one AU is equivalent to one slaughter or feeder cattle, calf, or heifer; 0.7 mature dairy cattle; 2.5 hogs (over 55 pounds) or 5 nursery pigs; 55 turkeys; 30 egg-laying chickens (wet manure systems); and 125 meat chickens and 82 egg-laying chickens (regardless of waste system used).

regulations are currently required to be in compliance with the existing regulatory program. As a result, all existing CAFOs with more than 1,000 AU—except poultry operations with dry manure management systems, which are not covered by the existing regulations—were costed for full compliance since they are covered by the existing regulations. This includes the NPDES regulations and the effluent limitations guidelines and standards for feedlots. For those operations with less than 1,000 AU, EPA used available data regarding current waste treatment practices under existing State laws and regulations to estimate the incremental cost they would incur to comply with the requirements of the proposed regulations.

EPA acknowledges comments claiming that many CAFOs do not have the necessary waste management components in place to comply with the existing CAFO regulations promulgated in 1974. Although the existing regulations were issued over 25 years ago, these commenters claim that many operations with 1,000 or more AU are not currently in compliance with these baseline requirements and would therefore incur substantial costs just to meet the 1974 requirements, in addition to any additional costs that would be incurred to comply with the new requirements of the proposed rule. Limited supporting data and information has been provided to EPA support these claims. However, EPA believes that it should consider only the costs attributable to the revised requirements and assume that existing CAFOs are in compliance with current requirements that were issued over 25 years ago. See also response to comment DCN CAFO400177-27 in EPA's Comment Response Document.

It is EPA's longstanding practice to attribute to a revised rule only the incremental cost of new requirements when revising existing regulations. EPA's methodology is authorized by the Clean Water Act (CWA). Under Section 301(b)(2)(B), EPA is required, when identifying BAT, to take into account a variety of factors, including the cost of achieving effluent reductions attainable through the application of BAT. The existing regulations identify BAT and require a certain level of effluent reduction. The effluent reductions attributable to the final revised regulation are those which are a result of new requirements. Therefore, EPA must evaluate the cost of achieving those additional reductions. The cost to implement Part 412 was considered when Part 412 was promulgated in 1974. If EPA were to now account for the cost to bring existing CAFOs into compliance with the 1974 requirements, the Agency would therefore bear the cost and impact of the 1974 regulation a second time. There should be no reward for non-compliance.

Not only is it statutorily required but reasonable to assume full compliance twenty-five (25) years after promulgation. The Clean Water Act (CWA), in Section 301(b)(3) states "for effluent limitations ... promulgated after January 1, 1982..., compliance as expeditiously as practicable but in no case later than three years after the date such limitations are promulgated (Part 412 was promulgated in 1974)...and in no case later than March 31, 1989..." Furthermore, the National Pollution Discharge Elimination System (NPDES) permits regulation at Part 122.47(a)(1) states, "Any schedules of compliance under this section shall require compliance as soon as possible, but not later than the applicable statutory deadlines under the CWA." 40 CFR 122.63(13) further states under compliance schedule "...In no case shall the compliance schedule be modified to extend beyond an applicable CWA statutory deadline for compliance." The statutory deadline for full compliance for Part 412 has long passed.

EPA believes that the Agency is well within any test of reasonableness to assume full compliance 25 years after the rule was promulgated. The practice of assuming compliance is consistent with EPA's published guidance for conducting regulatory analysis, outlined in EPA's "Guidelines for Preparing Economic Analyses, USEPA, 2000." EPA's guidance is available online at <http://www.epa.gov/economics/>. In accordance with EPA practice and guidance, EPA assumes that operations with 1,000 or more AU are in compliance with existing requirements promulgated in 1974;

these operations are assumed to have already incurred whatever costs were necessary to achieve compliance with these existing requirements.

As discussed in the 2001 Notice, guidance from the Office of Management and Budget (OMB), as outlined in “Economic Analysis of Federal Regulations Under Executive Order 12866,” recommends that the baseline for assessing the costs and benefits of a regulation be, “... the best assessment of the way the world would look absent the proposed regulation.” OMB’s guidance goes on to discuss various factors that may be considered in choosing an appropriate baseline, including existing regulations and the likely degree of compliance with these regulations, and recommends that, “when more than one baseline appears reasonable or the baseline is very uncertain, and when the estimated benefits and costs of proposed rules are likely to vary significantly with the baseline selected, the agency may choose to measure benefits and costs against multiple alternative baselines as a form of sensitivity analysis.” OMB’s guidance is available online at <http://www.whitehouse.gov/omb/inforeg/riaguide.html>.

EPA did consider ways to evaluate the possibility that there may be noncompliance with the existing regulations and the additional potential costs of compliance as a supplement to its cost and economic analyses. To evaluate the cost of the existing regulations, EPA requested additional data and information on current rates of non-compliance in a 2001 Notice of Data Availability (“2001 Notice” at 66 FR 58556). Information was requested on the number or share of operations with more than 1,000 AU that are not in compliance with the existing regulations. During the development of the proposed CAFO rulemaking, EPA requested additional data and information to substantiate industry claims of widespread non-compliance with the existing regulations. In the 2001 Notice, EPA requested information on current rates of non-compliance with the existing regulation, differentiated to the extent possible by production type or facility size for each of the major livestock and poultry sectors. This information would be needed to account for animal waste management systems and practices that are already being implemented at the CAFO to manage manure and wastewater, including practices associated with various voluntary programs as well as practices to assist with basic day-to-day production needs at the facility.

EPA considered using any information submitted to conduct an evaluation of the combined additional cost to comply with the existing regulations plus the incremental costs of the proposed regulations. In the 2001 Notice, EPA also solicited comment on an approach that would be conducted in two stages, which is outlined as follows.

The first stage of this analysis would assess the cost to CAFOs to comply with current requirements—specified for the production area—promulgated under the existing 1970s regulations and further evaluate the expected financial impacts of these costs. Using a representative farm approach, where the Agency determines that compliance with the existing regulations would have resulted in financial stress and potential closure of a representative facility, this operation would be removed from the analysis under the assumptions that this operation would not have remained in business. This representative facility would now constitute a baseline closure for purposes of evaluating the proposed revisions to the existing rule. This approach by which baseline closures are removed from any subsequent analyses is consistent with longstanding Agency practice to assess only the incremental costs associated with a specific regulatory action.

The second stage of this analysis would evaluate costs and financial impacts to comply with the revised requirements. These costs and impacts would be assessed for operations within the assumed remaining CAFO universe based on the number of operations assumed to have remained in business

while complying with the existing regulations (i.e., excluding assumed baseline closures determined to close under the existing regulations in the first stage of this analysis). This alternative approach likely would have resulted in a reduced total CAFO population for the purposes of EPA's regulatory analysis, since those CAFOs determined to be unable to absorb the costs of the existing 1974 effluent guidelines requirements would have been eliminated from the analysis prior to assessing the financial effects of the final revised requirements. This alternative approach might have allowed EPA to consider more stringent and more costly requirements for this rulemaking had EPA been focusing primarily on those more financially secure CAFOs that have already been successful in absorbing the costs of the existing requirements.

EPA solicited comment on this approach and requested data and information in order to conduct this supplemental analysis. Subsequent to the proposal and the 2001 Notice, EPA received no substantive data to document the claim of substantial non-compliance and associated compliance cost in the CAFO industry. Minimal data was submitted for two segments of the industry but the basis of these data were not included. Neither stage of this assessment could be addressed; therefore, EPA was unable to calculate a reasonable alternative cost estimate because no substantive and useful information is available or was provided by commenters.

Due to the lack of substantiation of the baseline compliance claims, EPA's final analysis continues to assume that operations with 1,000 or more AU are in compliance with existing regulations (not including poultry operations with dry manure management systems). Accordingly, EPA's estimates of the incremental costs attributable to the final regulations take into account information regarding current Federal and State requirements for animal feeding operations and calculate compliance costs of the final requirements that exceed the current requirements. Operations located in states that currently have requirements that meet or exceed the proposed regulatory changes would already be in compliance with the final regulations and would not incur any additional cost.

EPA's final analysis also accounts for current structures and practices, assumed to be in place already at operations, that may contribute towards compliance with the regulations. However, EPA has made significant improvements to its analysis to better estimate the types of practices and controls at existing facilities. EPA's analysis now provides an expanded range of cost estimates that accounts for greater variability across operations based on expected capital and management improvements needed. This approach is discussed in the following section Section 2.2.3 of this report. More detailed information is provided in the *Development Documents* (USEPA, 2002, 2001b).

2.2.3 Method for Estimating CAFO Compliance Costs

Section 4 of the Proposal EA summarizes EPA's approach to estimate compliance costs to CAFOs and to non-CAFO recipients of manure generated at CAFOs. EPA's *Development Documents* for the proposed and final rule provide detailed information on EPA's cost analysis (USEPA, 2001b, 2002).

For the purpose of estimating total costs and economic impacts, EPA calculates the costs of compliance for CAFOs to implement the final regulatory options being promulgated. EPA estimates costs associated with four broad cost components: nutrient management planning, facility upgrades, land application, and technologies for balancing on-farm nutrients. Nutrient management planning costs

include manure and soil testing, record keeping, and plan development, among other costs. Facility upgrades reflect costs for manure storage, mortality handling, storm water and field runoff controls, reduction of fresh water use, and additional farm management practices. Land application costs address agricultural application of nutrients, including hauling of excess manure off-site and adjusting for changes in commercial fertilizer needs, and reflect differences among operations based on cropland availability for manure application at a representative CAFO. Specific information on the capital costs, annual operating and maintenance costs, start-up or first-year costs, and also recurring costs that EPA uses to estimate impacts of the final regulations is provided in the *Development Document* (USEPA, 2002). EPA also uses these model CAFOs to estimate total aggregate incremental costs to the CAFO industry.

EPA evaluates compliance costs using a representative facility approach based on about 1,600 farm level cost models to depict conditions and to estimate compliance costs for select representative CAFOs (USEPA, 2002). The major factors used to differentiate individual model CAFOs include the commodity sector, the farm production region, and the facility size (based on herd or flock size or the number of animals on-site). EPA's model CAFOs primarily reflect the major animal sector groups, including beef cattle, dairy, hog, broiler, turkey, and egg-laying operations. Practices at other subsector operations are also reflected in the cost models, such as replacement heifer operations, veal operations, operations with flushed caged layers, and grow-finish and farrow-finish hog operations (USEPA, 2002, 2001b).³ EPA bases its analysis on results for model facilities with similar waste management and production practices to depict operations in regions that are not separately modeled.

Another key distinguishing factor incorporated into EPA's model CAFOs is information on the availability of cropland and pastureland for land application of manure nutrients. For this analysis, nitrogen and phosphorus rates of land application are evaluated for three categories of cropland availability: Category 1 CAFOs are assumed to have sufficient cropland for all on-farm nutrients generated, Category 2 CAFOs are assumed to have insufficient cropland, and Category 3 CAFOs are assumed to have no cropland (USEPA, 2002). EPA uses 1997 information from USDA to determine the number of CAFOs in each category. This information takes into account which nutrient (nitrogen or phosphorus) is used as the basis to assess land application and nutrient management costs.

For Category 2 and Category 3 CAFOs, EPA evaluates additional technologies that may be necessary to balance nutrients. Such technologies reduce off-site hauling costs associated with excess on-farm nutrients, as well as address ammonia redeposition, pathogens, trace metals, and antibiotic residuals. These technologies may include BMPs and various farm production technologies, such as feed management strategies, solid-liquid separation, composting, anaerobic digestion, and other retrofits to existing technologies. EPA considers all of these technologies for identification of "best available technologies economically achievable" (BATEA) under the various regulatory options described in the preamble for the final rulemaking.

For the proposal, EPA estimated compliance costs for a model CAFO facility by first estimating the total cost to an individual facility to employ a given technology including the full range of necessary capital, annual, start-up, and recurring costs. EPA then weights the average facility level cost to account for current use of the technology or management practice nationwide based on certain weighting factors,

³Grow-finish operations finish more mature pigs, while farrow-finish operations handle all stages of production from breeding to finishing.

referred to in the analysis as “frequency factors,” that the Agency assumes for each individual cost (each technology) and cost component (capital and annual costs) in each of its CAFO models (USEPA, 2002). Average costs were obtained by multiplying the total cost of a particular technology or practice by the frequency factor for that costing category, expressed as the percent of operations that are believed to use this particular technology or practice, to derive the average expected cost that could be incurred by a model CAFO. More information on how EPA developed and tested the frequency factors used for this analysis is provided in the *Development Documents* (USEPA, 2002, 2001b). These documents also provide additional information on the data and assumptions EPA uses for its cost models.

EPA received public comments that challenge this general approach because it fails to account for variability among operations. To address this concern, the 2001 Notice presents an alternative way to characterize the variability of costs that might be incurred by increasing the number of representative models used to assess compliance costs (66 FR 58572-58573). The 2001 Notice presents data and information from USDA that support this approach (see USEPA, 2002). This approach would first define a set of model CAFOs that represent typical or dominant production practices. Second, it would identify the expected compliance costs associated with the proposed CAFO rule requirements. Finally, it would adjust these costs according to how many CAFOs are expected to need upgrades to their facilities or practices to meet requirements. Compared to EPA’s analysis for the 2001 Proposal, this approach further breaks out these costs into three categories of farms based on the “average” operation and also operations with “least needs” and “most needs.” For the purpose of this analysis, EPA uses USDA’s simplifying assumption for this approach: 50 percent of all operations within each representative farm group represent the average, while each representative group representing operations outside the average accounts for 25 percent of all operations. More information on this approach is presented in the 2001 Notice (66 FR 58556) and the *Development Document* supporting the final rule (USEPA, 2002).

EPA’s cost models also account for other differences among operations, including soil type and other production factors, such as climate and farmland geography, land application and waste management practices, and other major production practices typically found in the key producing regions of the country. Model facilities reflect major production practices used by confinement operations with more than 300 AU. More information on EPA’s cost models is provided in the *Development Document* (USEPA, 2002).

Where costs are not estimated for operations with fewer than 300 AU (e.g., for operations *designated* as CAFOs because they are determined to contribute to water quality impairment), EPA uses available compliance costs for other model CAFOs. EPA approximates costs to expected designated facilities using estimated costs for the smallest size model CAFO among operations with between 300 and 1,000 AU (“Medium 1” operations),⁴ with the added assumption that these potential costs and effects are represented by costs developed to depict operations in the more traditional production regions (Midwest for the livestock and turkey operations and Southeast for the broiler and egg laying operations). For analysis purposes, EPA further assumes that these operations are characterized as having available land for land application of manure (Category 1 model facilities) and high technology needs (“most needs”). More detailed cost information is provided in the *Development Document* (USEPA, 2002) and related cost reports. See also EPA’s Comment Response Document available in the rulemaking record.

⁴The smallest model for wet layer is Medium 3, which were used for this analysis (see Tale 2-1).

2.2.4 Cost Annualization Methodology

EPA develops CAFO compliance costs from estimated start-up (first-year) costs, recurring 3-year and 5-year costs, and annual operating and maintenance costs. To compare estimated costs to available farm financial data in any one year, EPA annualizes these costs using the approach described below. A 1997 time frame is used for comparison with available USDA data on livestock and poultry farms, as reported in the 1997 Census of Agriculture and other related databases. The inputs and assumptions of the cost annualization model are summarized as follows.

Annualized costs account for the time value of money and reflect the annual repayment amount of an on-farm capital investment by spreading the initial costs over the expected life of the structure. EPA calculates both pre-tax and post-tax annual costs. Pre-tax costs are used to estimate the total cost of the final regulations to society (social costs). Post-tax costs are used to measure the economic impacts at CAFOs and to account for the reduction in a CAFO's tax liability. This reduction in taxes paid ("tax shield") offsets the expected compliance costs incurred by a facility. This portion of costs is borne by Federal and State governments through a reduction in tax revenue. Accordingly, the economic impacts of the final regulations are measured as the impact of the expected compliance cost incurred by a CAFO minus an appropriate tax shield.

The major inputs to and assumptions used in the cost annualization model are (1) the discount rate, (2) the life of the asset, and (3) tax rates. EPA uses the *discount rate* to calculate the present values of the cash flows. This rate is analogous to an interest rate used to compute a mortgage payment. The annualization model uses a real discount/interest rate of 7 percent, as recommended by the Office of Management and Budget (OMB, 1992), which does not have to be adjusted for inflation. EPA also evaluates costs assuming an alternative discount/interest rate of 3 percent to compare monetary benefit estimates using a range of rates (see the Benefits Analysis (USEPA, 2002k)). Cost estimates assuming an alternative 3 percent discount rate are also presented in Section 5, comparing estimated costs and benefits assuming this rate.

The *life of the asset* is the time period over which the costs are to be annualized (like a mortgage time period) and is determined according to the Internal Revenue Code's classes of depreciable property. The time period over which the annualization is made depends on the serviceable life of the structure as well as on the depreciable life, which affects what portion of a capital cost can be used each year to reduce taxable income. The Internal Revenue Service (IRS) rules govern the designation of depreciable life, which is assigned on the basis of serviceable life. Most of the types of capital investments required under these regulations are typically depreciated over 10 years (IRS, 1999c).⁵ The cost annualization model thus incorporates a 10-year annualization period to compute both pre-tax and post-tax annual costs. The equation EPA uses to calculate annual cost operates from mid-year to mid-year (mid-year convention); therefore, the entire time frame of the analysis begins in Year 1 and concludes in Year 11 but is discussed here as a 10-year time frame (see Appendix A).

The assumed *tax rates* are used to determine a facility's tax benefit or tax shield. Estimated tax savings are subtracted from the actual outlay in each year and are used to calculate the annual post-tax

⁵Many of the types of investments would best be classified as single-purpose agricultural structures, which IRS defines as enclosures or structures specifically designed, constructed, and used for housing, raising, and feeding a particular kind of livestock, including structures to contain produce or equipment necessary for housing, raising, and feeding livestock.

cost of compliance. The tax shield calculation uses three inputs: marginal tax rates (composed of Federal tax rates and an assumed State tax rate); an estimate of CAFO taxable income (net cash minus depreciation plus value of inventory change, assuming the CAFO is using the accrual method of accounting); and a depreciation schedule.

EPA calculates compliance costs to CAFOs under both pre-tax and post-tax scenarios. The pre-tax costs reflect the estimated total social cost of the final regulations, including lost tax revenue to governments. EPA uses calculated pre-tax dollars when comparing estimated costs to monetized benefits that are estimated to accrue under the final regulations. (EPA also uses pre-tax costs to conduct an initial screener of CAFO level financial effects; see Section 2.4.) Post-tax costs reflect the fact that a CAFO would be able to depreciate or expense these costs, thus generating a tax savings. Post-tax costs thus are the actual costs the CAFO would face. For this reason, EPA evaluates cash flow changes at CAFOs over time taking into account the tax savings to facilities, according to estimated post-tax costs, using available Federal and State tax information to compute the expected tax shield for a representative model facility (see Section 2.4).

Appendix A provides a description of how the tax rates are assigned to each model CAFO. The depreciation schedule is dictated by IRS rules, but there are several choices of depreciation schedule within those rules. For reasons outlined in Appendix A, EPA has chosen the Modified Accelerated Cost Recovery System (MACRS), which is a commonly used and generally advantageous depreciation schedule for tax minimization purposes. The tax shield is calculated using the depreciable capital cost in each year plus any recurring expenditures allowed to be expensed in each year. Each model CAFO is assigned a tax rate (marginal Federal rate plus an assumed State tax rate) based on the estimated amount of taxable income. The tax rate times the depreciated and expensed compliance cost in each year equals the estimated tax shield.

Appendix A of this report also provides more detailed information on the cost annualization approach used for this analysis and presents a sample spreadsheet that shows how all of the computations are made. The appendices also document all annualized incremental costs estimated by EPA (pre-tax, expressed in 1997 dollars) by model facility and by animal inventory (Appendix B) for each of the major livestock and poultry sectors. Section 3 presents the aggregated, national level annualized compliance costs (pre-tax, 2001 dollars) for the final regulations. Input costs used for this analysis are provided in the *Development Document* (USEPA, 2002).

2.3 BASELINE FINANCIAL DATA FOR EPA MODEL CAFOs

This section describes the data that EPA uses to depict baseline financial conditions at regulated CAFOs. Section 2.3.1 describes the sources of data used for the 2001 Proposal and alternative data that EPA received during the comment period to address public comments on the data and approach that the Agency uses to assess regulatory impacts for the final regulations. Section 2.3.2 discusses the process EPA uses to select among the available data to build baseline financial models for each of the affected sectors and also describes, in some cases, any adjustments that EPA made to these data. Section 2.3.3 briefly restates how EPA matches these financial models to the cost models developed to represent model CAFO facilities, which is described in more detail in the Proposal EA (USEPA, 2001a).

The financial data presented in this section reflect consideration of alternative data for use in EPA's analysis based on comments received during the public comment period. During this period, EPA received many comments on the financial data used to estimate CAFO level effects in the 2001 Proposal. In many cases, these comments were accompanied by alternative financial data for consideration by EPA. Among the principal comments that EPA received on its Proposal EA is the need to separately evaluate effects on an individual operation's livestock or poultry enterprise. This recommendation originated from USDA, various land grant universities, and some industry representatives. The comments recommend that EPA evaluate impacts using livestock enterprise level data that do not include revenue from other farm-related sources (e.g., secondary livestock, crops, government payments). This approach differs from the approach EPA used to evaluate effects for the 2001 Proposal, where only farm level financial data were used to evaluate regulatory impacts on CAFOs using financial data that include revenue from other farm-related sources. This change in the approach and underlying data for the analysis was presented in the 2001 Notice. This section describes these data for EPA's final analysis and describes additional adjustments that EPA made to respond to other public comments received on the 2001 Proposal, the 2001 Notice, and the 2002 Notice.

2.3.1 Sources of Data

To evaluate the regulatory impacts of the final regulations, EPA uses both farm level and enterprise level financial data compiled from a variety of sources, including USDA, various land grant universities and academic research organizations, as well as data provided by the regulated industry.

The financial data that EPA uses for its analysis of the final CAFO regulations depict baseline conditions at both the farm level and enterprise level. At the farm level, for most sectors, EPA will continue to use available 1997 farm level data from USDA, which EPA used for proposal. For the cattle feeding, dairy, and hog sectors, EPA substitutes the financial data used for proposal with alternative data obtained since proposal, as discussed later in this report. For the poultry sectors, EPA continues to use the 1997 USDA farm level data used for proposal, but also uses additional enterprise level data obtained from USDA and various land grant universities. All alternative data used by EPA were presented in both the 2001 Notice and the 2002 Notice. More information is provided in the rulemaking record.

2.3.1.1 USDA's Agricultural Resource Management Study

A key source of financial data used by EPA to evaluate the regulatory impacts of the final regulations is USDA's ARMS data. The ARMS is USDA's primary method for collecting data covering a broad range of issues about agricultural production practices and costs. These data provide the only national perspective on annual changes in the financial conditions of production agriculture (USDA/ERS, 2000a). The ARMS is an annual survey conducted using a probability sample, which in 1997 included information from 11,724 surveyed farms nationwide. The sample survey is hand-enumerated by trained personnel. USDA extrapolates the data from the sample survey to represent farming and ranching operations in the 48 contiguous states. These national level data are published in a series of annual and periodic reports, such as USDA ERS's annual compendiums on farm costs of production and on farm financial performance (data formerly identified as the Farm Costs and Returns Survey data).

Data on both family and nonfamily farms are included in the ARMS data (USDA/ERS, 2000b, 1999a). USDA's farm typology data also provide information on animal ownership based on the

percentage of animals raised at the farm site that are owned or not owned by the farmer (e.g., raised under contract for another business entity) (USDA/ERS, 1999a). This information is useful for understanding the average data, which include all the different farm structure types that are captured in the aggregated ARMS data for each livestock and poultry sector. The ARMS revenue data are separable by enterprise (livestock and crops), as well as by other farm-related income and government payments. Off-farm revenue is not included in the ARMS data used by EPA for this analysis, as described previously under revenue definitions for “Income Statement Information.” However, the ARMS operating expense data are not separable by enterprise (e.g., buildings, labor and equipment for crop versus livestock production), but instead represent average production costs for an operation as a whole. This generally limits the types of analyses that EPA can conduct using these data for its economic impact analysis. Also, USDA information on off-farm revenue is not included in this analysis.

Aggregated ARMS data are readily available through periodic compendiums published by USDA. To depict financial conditions for selected representative farm groups, EPA requested that USDA provide these data on a more disaggregated basis than that found in the published data. As noted extensively throughout the 2001 Proposal and various support documents, USDA periodically publishes summary data from its farm level databases and provides customized analyses of the data to the public and other government agencies. The requested ARMS data summaries were compiled with the assistance of staff at USDA’s ERS, who performed special tabulations of the data to differentiate the financial conditions among farms by selected facility size categories and by primary producing region for each sector. ERS developed a methodology for identifying farms likely to be CAFOs based on reported survey information, and developed estimates of animal units on these operations based on reported data. Given these estimates, farms were grouped into animal unit size categories and data were provided to EPA and other government agencies. All data provided to EPA are sufficiently aggregated to ensure the confidentiality of an individual farming operation and to maintain the statistical representativeness of the sample data.

In general, the published data provide financial information on a total, national basis across all farms for only four aggregated sectors: beef, dairy, hogs, and poultry. These data are reported across all production types and businesses, and in the poultry sector thus combine information across all broiler, turkey, and egg laying operations. However, the underlying ARMS database provides information on the financial conditions within individual sectors. These data can also be grouped to show differences among farms by facility size and production region, among other factors.

For the purposes of EPA’s analysis, the Agency requested more detailed data from USDA for the poultry sector (1997 data), the hog sector (1998 data), and the dairy sector (2000 data). In some cases, USDA data are not available for each level of aggregation because of confidentiality and nondisclosure requirements, requiring that EPA use national level data. For the poultry sectors, the 1997 ARMS, which was conducted in conjunction with USDA efforts to collect the 1997 Census, contains more detailed information and allows for the breakout of financial conditions across the poultry category, including broiler, turkey, and egg-laying operations. EPA uses the farm level data to estimate financial effects on poultry operations for the 2001 Proposal. Since the 2001 Proposal, EPA has obtained additional financial data for the hog and dairy sectors from a special ARMS compilation of these sectors. These data provide a means for USDA to break out enterprise level operating revenues and costs to depict financial conditions at an operation’s livestock or poultry enterprise separate from the revenues and costs for the whole facility. The 1997 ARMS operating expenses data are not distinguishable by business enterprise, but are the total for the business. For the hog sector, these data allow for greater breakout of financial conditions across the different production types (farrowing, farrow-finish, and grow-finish) as

well as across different business types (contract grower and independent owner-operator). The rulemaking record documents how EPA worked with USDA to obtain additional data since the 2001 Proposal (see: USEPA, 2002a, 2002b, 2002c, 2002d, 2002f, 2001c, and 2001d; USDA/ERS, 2002a, 2002b, 2002c, 2002d, 2001, 2001a, 2001b, 2001c, and 2001d; ERG, 2002c; ERG and DPRA, 2001). A detailed summary of how EPA uses the available hog data obtained from USDA is available in the record (ERG, 2002c—DCN 375083).

Financial data obtained by USDA from its ARMS and related databases are based on average end-of-year farm inventories. 1997 ARMS data obtained by USDA include information on the total number of farms and the total number of animals in the sample set. These data correspond exclusively to the average income statement and balance sheet information for representative farms compiled by ERS for each aggregated data grouping by commodity, production region, and facility size groups (USDA/ERS, 1999a). EPA uses these data to calculate financial data on a per-animal inventory. (See Section 4.2.4 of the Proposal EA [USEPA, 2001a], which also describes how EPA compiled its financial models using the 1997 ARMS data.) Data obtained from USDA by special compilation of recent hog and dairy financial data were translated on a per-animal inventory basis by USDA (USDA/ERS, 2002a, 2002b, 2002c).

2.3.1.2 Data from Various Land Grant Universities

To supplement EPA's farm level assessment of regulatory impacts conducted for the 2001 Proposal with an assessment of impacts at an operation's livestock or poultry enterprise, EPA obtained enterprise level financial data or "enterprise budgets" from a variety of land grant universities and academic research organizations.

Enterprise budgets are useful tools for examining the potential profitability of an enterprise before actually making an investment. To create an enterprise budget, an analyst gathers information on capital investments, variable costs (such as labor and feed), and fixed costs (e.g., interest and insurance), combined with price information and typical production yields, to estimate annual revenues, costs, and returns for a project. By varying different input parameters, enterprise budgets can be used to examine the relative importance of individual parameters to the financial return of the project or to identify break-even prices required to provide a positive return.

As part of EPA's public comment period, FAPRI submitted enterprise budgets developed by a panel of industry experts (FAPRI, 2001a). (See: DCN 235619.) For its study, FAPRI convened a panel of experts "to provide a snapshot of each enterprise at a given point in time" (FAPRI, 2001a, 2001b). These experts developed information on the financial characteristics of each model farm at the enterprise level for 2000. FAPRI did not provide corresponding revenue and cost data at the farm level, which would have allowed EPA to appropriately conduct its discounted cash flow analysis at the farm level. Enterprise data submitted are in the form of full financial statements and include other information such as beginning cash reserves, productivity measures, and feed efficiency. These data cover cattle, dairy, and hog (farrow-finish independent) operations, and they vary by select facility size grouping and production region for each sector (FAPRI, 2001a). Although the data are for a single year, other information provided by FAPRI allows for a more extensive analysis of expected changes over a 10-year period (2001 to 2011) based on FAPRI's projections, taking into account pricing cycles. Other available timeline data are from FAPRI's periodic *U.S. Baseline Briefing Book* (FAPRI, 2001c, 2001d). FAPRI's reports are provided in EPA's record and are also available at FAPRI's web site.

Since the publication of the 2001 Proposal, EPA has collected other published “enterprise budget” data from various land grant university sources to further evaluate the availability of usable enterprise level data and information. Given the lack of other available financial data for the poultry sectors, EPA uses published enterprise budgets to depict enterprise level financial conditions for broiler, egg, and turkey operations (as discussed in Section 2.4.2). As part of EPA’s overall effort, however, enterprise budgets were compiled for beef feedlots (14 budgets), farrow-finish hog operations (10 budgets), grow-finish hog operations (5 budgets), dairy operations (7 budgets), heifer operations (4 budgets), and broiler operations (3 budgets). Since the publication of the 2001 Notice, EPA also obtained enterprise budgets for the egg and turkey sectors, which were provided when the 2002 Notice was published. The range of sources includes the University of Idaho, Iowa State University, Ohio State University, Oklahoma State University, Kansas State University, North Carolina State University, Ohio State University, Clemson University, and University of Arkansas. The enterprise budgets span a wide range of assumptions, including size and type of operation; type, age, or sex of animal raised; and feed and operating efficiency. The budgets vary greatly with respect to line items, which items were considered variable or fixed, whether depreciation and interest were reported separately, and whether a capital recovery item or building and equipment charge was reported. The years represented by data in these budgets varies, tending to be within the period from 1997 to 2000, with some exceptions. A summary of all the enterprise budget data collected for the purpose of identifying alternative financial data is provided in the record (see: ERG, 2001d), along with additional citations on poultry data used by EPA (see: DCN 175024, DCN 375036, DCN 375048, and DCN 375049).

2.3.1.3 Data from National Cattlemen’s Beef Association

As discussed in the 2001 Notice, during the development of the proposed rulemaking EPA received alternative enterprise level data for the cattle feeding sector from NCBA based on a survey of its membership. For reasons described in the Proposal EA and the 2001 Notice, EPA decided not to base its economic analysis on NCBA’s data for the proposal. Instead, given the lack of other statistically validated survey data for this sector, EPA used USDA’s 1997 ARMS data for beef operations despite recognition of the limitations of these data for assessing cattle feeding operations. Both before EPA’s proposal and during the comment period, NCBA expressed concern that the ARMS data are more reflective of cow-calf operations and represent few feedlots and, therefore, might not be representative of operations in this sector. USDA also indicated to EPA that the available ARMS data are more reflective of cow-calf operations and might not be suitable for evaluating impacts on cattle feeding operations. In public comments on the 2001 Proposal, researchers at Iowa State University also suggested that the use of ARMS data to represent beef feedlots is inappropriate (see: DCN 201602).

As part of EPA’s public comment period, NCBA submitted additional financial data and information for cattle feeding operations (NCBA, 2001). (See: DCN 201165.) This new data submission addresses many of EPA’s initial concerns about NCBA’s previously submitted survey data. It provides additional details about how these data were collected and includes additional information that allows EPA to more fully evaluate these survey data. NCBA’s data submission also includes projections by NCBA based on these baseline data over the time frame of EPA’s analysis (NCBA, 2001, 2002).

The 2001 Notice presents data provided by NCBA, representing results of surveys of NCBA’s membership. These data consist of a total of 66 surveys with 1997 financial data, 72 surveys with 1998 data, and 73 surveys with 1999 data returned by respondents. Of these, 54, 60, and 58, respectively, were used by NCBA to characterize the finances of the beef feedlots represented by these survey data. These

data are enterprise level data but include information on both company-owned cattle and cattle that are not owned by the feedlot but are fed on-site (e.g., custom operations). For the purpose of this analysis, EPA assumes that these data are representative of both the enterprise and farm because the data are more inclusive of a range of revenue sources. These data are used to depict conditions at larger beef operations based on NCBA survey results, which represent operations marketing an average of 52,000 cattle annually. Regional breakouts are not provided. NCBA presented gross receipts, total operating costs, interest payments and receipts, net cash income, depreciation, pre-tax net income, current assets, total assets, current liabilities, total liabilities, and total equity. NCBA also provided a variety of ratios, including debt-assets. These key parameters represent an average over a 3-year period from 1997 to 1999.

The next section of this report further describe the NCBA survey data submitted to EPA and discuss the Agency's rationale for choosing these data. These data are available in EPA's record (NCBA, 2001—DCN 201165), along with the an assessment comparing NCBA's data against information available from other sources (see ERG, 2001b). Also see EPA's response to comments on the data used to depict financial conditions at cattle feeding operations in the Comment Response Document available in the rulemaking record (see response to comment DCN CAFO 201602-22).

2.3.2 Data Selection and Modification for EPA's Financial Models

This section discusses EPA's process to select among the available data to build baseline financial models for each of the affected industry categories—cattle, dairy, hog, and poultry sectors—and also describes, in some cases, any adjustments made to these data by EPA. Data tables are presented at the end of this section. All financial variables used for EPA's analysis conform to established practices and standards for specifying commodity cost and returns, consistent with those used by USDA and set by American Agricultural Economics Association guidelines (AAEA, 2001).

For the some sectors, EPA continues to use available 1997 data from USDA reflecting financial conditions at the farm level, which the Agency used for proposal. For the livestock (cattle feeding, dairy, and hog) sectors, EPA has replaced the 1997 USDA data used for proposal with other farm level and enterprise level data, which were presented in both the 2001 Notice and 2002 Notice. For cattle operations, EPA uses financial data provided by NCBA and FAPRI. For dairy and hog operations, EPA uses alternative data from USDA. For the poultry (broiler, egg, and turkey) sectors, EPA continues to use USDA's farm level data used for proposal, but supplements these data with with limited available enterprise level data obtained since proposal.

As discussed in both the 2001 Notice and the 2002 Notice, among the principal comments that EPA received on its Proposal EA is the recommendation to separately evaluate effects on an individual operation's livestock or poultry enterprise. This recommendation originated from USDA, various land grant universities, and some industry representatives. It was suggested that EPA evaluate impacts using livestock enterprise level data that do not consider revenue from other farm-related sources (e.g., secondary livestock, crops, government payments). This approach differs from the 2001 Proposal, where only farm level financial data were used to evaluate regulatory impacts on CAFOs, using financial data that include revenue from other farm-related sources. To support this comment and to encourage EPA to use alternative data for its analysis, many commenters submitted enterprise level data to the Agency during the comment period, which are presented in the 2001 Notice.

To address comments that criticize EPA's use of a single year of financial data to reflect baseline conditions, the Agency adjusts financial data for the cattle, hog, and dairy sectors (using other available published data from USDA, FAPRI, and the land grant universities) to average out conditions over multiple years. This approach involves incorporating other available data into the analysis to obtain average conditions over a multiple year time frame, as discussed in the 2001 Notice (see 66 FR 58590-58591). Because of the lack of multiple years of financial data for the poultry sectors, EPA is not able to use this approach for those types of operations and is instead continuing to use a single year of data. Other recommended changes to the data that EPA uses for its analysis include the use of alternative data to project conditions over the time frame of the analysis (1997-2006), which is also discussed in both of EPA's published Notices.

For more information, see EPA's response to comments received during the public comment period regarding the financial data and the analytical approach that the Agency uses compile aggregate costs and to assess regulatory effects on CAFOs. These response to comments address alternative data and recommended changes to EPA's assessment approach. Relevant response to comments in the Comment Response Document include EPA's use of alternative data EPA uses (DCNs 201602-22, 400158-91, 400165-36, 202013-2, 201605-13 and 201352-108, 201352-136-4) and related adjustments using best available data to modify EPA's assessment approach (see, for example, 202402-35 regarding its enterprise analysis, 400158-92 regarding adjustment to average out single year of data, 201352-101 on projections used, and adjustments and clarification on the assessment criteria used in 201352-35, 201335-104, 201438-207-1, 201335-104, 210352-106, and 201438-207-1), among other Agency comment responses. The Comment Response Document available in the rulemaking record.

2.3.2.1 Cattle Sector

Because of USDA's concerns that the financial data for this sector might be more reflective of cow-calf operations and not suitable for evaluating impacts to cattle feeding operations (see: 2001 Notice, 66 FR 58585-58587), EPA is replacing the financial data for this sector used in the Proposal EA. Instead, for its final analysis of impacts on the cattle feeding sector, EPA uses financial data submitted by NCBA and FAPRI, along with available enterprise level data for heifers from the University of Idaho. A summary of the input data that EPA uses for its analysis is presented in Tables 2-2 and 2-3.

For operations with more than 1,000 AU, EPA uses data provided by NCBA for operations with an average of 52,000 head (see: DCN 175044). For operations with between 300 and 1,000 AU, EPA uses data submitted by FAPRI for a 500-head feedlot enterprise (DCN 175038). For the purposes of this analysis, and because of the lack of additional available data, EPA assumes that these data reflect baseline financial conditions for operations with fed cattle and veal. For operations raising heifers, EPA uses enterprise budget data for heifer replacements given the availability of 1998 data from the University of Idaho (DCN 175033 and DCN 175034). EPA presented those data in the 2001 Notice (66 FR 58589). Each of these data sources represent enterprise level conditions. Farm level data are not available; therefore, EPA's analysis assumes that farm and enterprise conditions are the same.

EPA has evaluated the reasonableness of both the NCBA and FAPRI data (ERG, 2001a). Because of limited financial data on cattle feeding operations, little additional information is available for this sector to conduct an in-depth comparison. The use of these data is supported by information cited by Koontz et al. (2000), reporting average industry returns of \$10 to \$15 per head, along with high-end returns of \$11 to \$25 per head (assuming certain production equipment). Assuming returns reported

by Koontz et al. (2000) are primarily cash-based returns, they compare to the calculated midpoint of \$10 to \$12 per head based on the ranges assumed by EPA for its analysis (EPA assumes values for net cash income ranging from a \$7 per head loss to earnings of \$30 per head, depending on facility size). This information generally supports the level of net cash per head that EPA assumes for its discounted cash flow analysis for cattle feedlots. EPA selected the NCBA survey data for large feedlots because these data are more representative of larger operations. EPA has evaluated NCBA's financial data against those provided by FAPRI, and they compare closely. EPA also provided initial review and input to NCBA on each of its survey questionnaires developed for this rulemaking. For more information, see Section 8.1.3 of the Proposal EA.

EPA selected to use the alternative NCBA and FAPRI data over other more limited available data and information, including data submitted by Iowa State University (ISU, 2001) and enterprise budgets obtained from various land grant universities (see ERG, 2001d). EPA also chose NCBA and FAPRI data because all key data for the analysis were provided in one data source (revenues, net cash, total liabilities and total assets). Other advantages of these data are as follows.

Because nearly all operations responding to NCBA's survey are significantly larger than operations with fewer than 1,000 AU, EPA uses the FAPRI enterprise data for operations in this size category. FAPRI's data, which EPA uses for operations with fewer than 1,000 AU, were compiled using an "expert panel" approach. Some commenters object to the use of FAPRI-supplied financial data because these data were developed using a panel approach, which they perceive as potentially biasing the data. EPA disagrees with these comments. Use of an expert panel approach to obtain information about a representative facility's financial conditions is a longstanding and common practice used by FAPRI and other land grant university researchers to assess the implications of public policy on the agricultural sectors. Such an approach allows researchers to compile data and other information to address policy questions where other statistically valid data are not available. Even statistical survey data can vary, depending on what data are used (e.g., time period captured, sample size and representativeness, etc.). Although EPA recognizes that expert panel-generated data may be variable across different panels, statistical data are also variable, since each value generated by a statistical survey is subject to statistical variance and the same survey of a different group of respondents will not yield exactly the same results. In the past, the courts have upheld EPA's use of data, even though not perfect, as long as EPA uses the best data available in the best way the Agency can. Moreover, FAPRI data and analyses span decades of ongoing research work and are well-recognized within the agricultural research community and among land grant university researchers. Evidence of the community's regard for FAPRI's research contribution is shown by a 2002 nomination by the American Agricultural Economics Association (AAEA), the organization that publishes the leading agricultural economics research journal, for the AAEA Distinguished Policy Contribution Award—a nomination supported by the U.S. House of Representatives' Committee of Agriculture for FAPRI's contribution during the 2002 congressional farm bill debate (see AAEA, 2002—DCN 375112).

EPA decided to use available NCBA and FAPRI financial data instead of other available "enterprise budget" data that have been developed by various land grant universities (see ERG, 2001d) for the following reasons. Enterprise budgets are developed to characterize possible revenues and costs that might be encountered by a farm that is interested in developing that enterprise. The revenues and costs are presented as examples, and typically the source indicates that the farmer should develop the budget using his or her best estimates of revenues and costs specific to that operation because, as many budgets note, "your costs or revenues may vary from those shown" (ERG, 2001d). Thus, farmers often use enterprise budgets as a template, not as the final word on whether to undertake the enterprise at a

specific operation. Enterprise budgets are very dependent on detailed assumptions and conditions, some of which are documented but some of which are not. Therefore, enterprise budgets might not truly represent conditions across a broad range of facilities. FAPRI's budgets are compiled using an "expert panel" approach to develop a representative financial model, which is a common and established practice in the field of agricultural policy research. Enterprise budget data are also not straightforward and easily interpreted because these data are not presented in terms of a standard income statement or balance sheet. Additional interpretation of line items is often required to determine whether they constitute actual cash items, opportunity costs, or noncash items (e.g., operating interest or labor). FAPRI data are more explicit and are presented in terms of a standard income statement or balance sheet line items. Furthermore, the FAPRI data explicitly provide asset and liability assumptions specific to the models, whereas many enterprise budgets do not explicitly provide such data.

As discussed in the 2001 Notice, to address recommendations that EPA average out baseline conditions to better account for year-to-year variability and pricing cycles (see 66 FR 58590), EPA uses the 3 years of survey data (1997 to 1999) provided by NCBA to calculate an average gross revenue value for its analysis using the sales test (NCBA, 2001). From the FAPRI data, which include a 2000 base year along with several years of projected data (2000 to 2011), EPA uses the first 3 years of reported revenue (2000 to 2002) to obtain an average total revenue value. EPA uses average values to address recommendations expressed during the public comment period. These comments suggest that EPA consider ways to depict financial conditions over multiple years, despite the availability of only a single year of data in some cases (see 66 FR 58590).

Tables 2-2 and 2-3 show the resultant average gross revenue values that EPA assumes for this analysis. At operations with more than 1,000 AU, the estimate is \$475 per head revenue. This estimate compares to the average value of \$945 per head assumed for operations with fewer than 1,000 AU. These average values reflect revenue per head sold (or, in the case of the NCBA data, revenue per head marketed, which includes the number of head sold plus the number of head fed under contract that were sent to market). The NCBA data highlight two distinct operations at large feedlots: custom feeding operations and company-owned cattle operations. The difference in revenue per head between these two size categories is attributable to the inclusion of information for custom cattle feeding operations in the NCBA data. The custom feeding portion of a feedlot operation has a different revenue and cost structure than the company-owned portion of the business because the feedlot does not buy or sell these cattle; rather, a price for keeping and feeding these cattle is paid, leading to lower revenues, but also lower costs. The NCBA revenue figure of \$475 per head reflects the weighted average of per-head revenues for the company owned cattle enterprise and per-head revenues for the custom feeding enterprise. Because these data are for EPA's sales test, which is used principally as an initial screener to indicate the need for further analysis (see Section 2.4), the revenue data EPA uses for this analysis do not substantially affect the overall results of the Agency's analysis. Moreover, differences in the financial data among production types are less stark once revenues and costs are jointly considered, resulting in more comparable net cash income values.

EPA's discounted cash flow (DCF) analysis already accounts for variability and changing conditions over multiple years. This analysis spans a 10-year time frame (1997 to 2006) and uses time series projections. This approach is consistent with that used for the 2001 Proposal. For this analysis, EPA obtains net cash income estimates at both the farm and enterprise level for the base year (1997) from the available data. EPA uses NCBA data from 1997 for cattle operations with more than 1,000 AU (NCBA, 2001); EPA derives a base year estimate from available FAPRI data for 2000 (FAPRI, 2001), back-calculated to 1997 using the NCBA time series data (NCBA, 2001).

EPA projects out the 1997 baseline data using NCBA-reported data on costs and returns to feedlot enterprises, expressed as dollars per marketed head, to obtain a cash flow stream over the analysis period (1997 to 2006). NCBA's projection covers the 10-year analysis period, relying on historical data and pricing trends in the cattle cycle that correspond to the 3 years of data in the association's survey. EPA uses projected returns made by NCBA that were submitted to EPA (NCBA, 2001). See Table 2-4. Alternative projections by FAPRI and USDA report net returns to cow-calf operations only, which might not correspond to trends in the cattle feeding sector that will be subject to the revised regulations. The FAPRI projections for its 500-head feedlot model also do not cover the 1997 to 2006 time period used for EPA's analysis. The method EPA uses to project the baseline data follows the approach used to support the 2001 Proposal (see Section 4 of the Proposal EA). From this projected cash stream, EPA estimates the net present value estimates for use in its DCF analysis. Table 2-5 shows specific line item definitions. A summary of these values at both the farm level and enterprise level is presented in Tables 2-6 and 2-7.

For the debt-asset test, EPA uses both NCBA and FAPRI data on total assets and total liabilities for operations of similar size in this sector (FAPRI, 2001a), replacing the USDA asset and liability data used for proposal. As with the other financial data, EPA uses NCBA data for operations with more than 1,000 AU and FAPRI data for operations with between 300 and 1,000 AU.⁶ See Table 2-2. Use of the alternative data addresses concerns expressed during the public comment period about EPA's assumptions of baseline debt and equity conditions at CAFOs and the data on debts and assets assumed for the proposed rulemaking (see: 2001 Notice, 66 FR 58582-58583). These data exclude smaller sized, typically older, operations that may carry less debt, and focus on larger sized facilities that are often more capital-intensive or might be seeking to expand, thus requiring additional capital investment. EPA uses these alternative debt and asset data for its debt-asset test—instead of USDA data—since these data are likely more representative of the debt load and size of operation affected by the final regulations.

For more information, refer to EPA's Comment Response Document available in the record for the Agency's response to comments on the financial data used to depict financial conditions for this sector, as well as other responses to comments about the financial tests used to evaluate this rule.

2.3.2.2 Dairy Sector

For dairy operations, EPA replaces the 1997 USDA farm level data that were used for the proposal analysis with alternative data provided by USDA based on a special USDA survey of the dairy sector in 2000 (USDA/ERS, 2002c—DCN 375085). A summary of the farm level and enterprise level input data that EPA uses for its analysis is presented in Tables 2-2 and 2-3.

The alternative 2000 USDA data for dairies have the advantage of providing both farm level and enterprise level data from a single data source. Another advantage of using USDA's data is that these data are based on an actual producer survey. As with all other data provided by USDA, these data were compiled by USDA's ERS for EPA's use and were sufficiently aggregated to mask any confidential business information. Given the availability of this single and up-to-date data source, EPA decided to use these data instead of a compilation of farm level data from the 1997 ARMS data set from USDA used

⁶ The resultant ratio using these alternative NCBA and FAPRI data provide an identical debt-asset ratio of 68 percent for use in EPA's debt-asset test, although the representative model debt and asset data may differ.

for the proposal analysis (USDA/ERS, 1999a), along with enterprise level data submitted by FAPRI (FAPRI, 2001a—DCN 175038) and/or enterprise budget data from various land grant universities (see ERG, 2001d). EPA's evaluation of each of these data sources, however, indicate that these data compare favorably to one another. The alternative FAPRI and enterprise budget data were presented in the 2001 Notice (66 FR 58588-58589), soliciting further public comment on their use for this analysis. The alternative 2000 USDA data were discussed in the 2002 Notice (see 67 FR 48108 and DCN 375084) and available for public review in the rulemaking record.

EPA conducted additional sensitivity analyses of these data by comparing the results of the Agency's main analysis using new farm level and enterprise level data from USDA for the year 2000 against the results of an alternative analysis using the 1997 USDA farm level data used for proposal and other enterprise data submitted by FAPRI. The results of this analysis indicate that EPA's analysis results are stable across a range of input data (ERG, 2002c—DCN 375111).

To address recommendations that EPA average out baseline conditions to better account for year-to-year variability and pricing cycles (see: 2001 Notice, 66 FR 58590), EPA adjusts the available 1997 gross income data prior to evaluating these data. This evaluation is done as part of EPA's sales test using published USDA cost and returns data for U.S. dairy operations, spanning 1993 to 2000. These national level data are used to create an index of 8 years of farm level financial data from which to project 1997 gross sales data, producing an average 8-year revenue value.

EPA's DCF analysis, which spans a 10-year time frame (1997 to 2006) and uses time series projections, already accounts for variability and changing conditions over multiple years. This approach is consistent with that used for the 2001 Proposal. For this analysis, EPA obtains net cash income estimates at both at the farm level and enterprise level for the base year (1997) from the available data. At the farm level, EPA projects the 1997 baseline data using USDA-reported net returns for the dairy sector to obtain a cash flow stream over the analysis period (1997 to 2006). At the enterprise level, EPA uses the 2000 net cash income for representative dairy operations submitted by FAPRI. The 2000 data are back calculated to 1997 and projected from 2000 to 2006 using the same USDA-reported net returns for the dairy sector that are used to adjust the farm level data. EPA continues to use the same USDA projections that were used for the 2001 Proposal (USDA/WAOB, 1999, 2000, 2002; see Table 2-4) because other available projections do not regularly report net returns per milk cow. They also do not cover the 1997 to 2006 time period for EPA's analysis. The method that EPA uses to project the baseline data follows the approach used for the Proposal EA. From this projected cash stream, EPA estimates the net present value for use in its DCF analysis. (Table 2-5 shows specific line item definitions.) A summary of these values at both the farm level and enterprise level is presented in Tables 2-6 and 2-7.

For the debt-asset test, EPA uses FAPRI data on total assets and total liabilities for operations of similar size in this sector (FAPRI, 2001a), replacing the USDA asset and liability data used for proposal. Use of the alternative data addresses concerns expressed during the public comment period about EPA's assumptions of baseline debt and equity conditions at CAFOs and the data on debts and assets assumed for the proposed rulemaking (see: 2001 Notice, 66 FR 58582-58583). These FAPRI data exclude smaller sized, typically older, operations that may carry less debt, and focus on larger sized facilities that are often more capital-intensive or might be seeking to expand, thus requiring additional capital investment. EPA uses the FAPRI debt and asset data for its debt-asset test, instead of USDA data, since FAPRI's data are likely more representative of the debt load and size of operation affected by the final regulations.

For more information, refer to EPA's Comment Response Document available in the record for the Agency's response to comments on the financial data used to depict financial conditions for this sector, as well as other responses to comments about the financial tests used to evaluate this rule.

2.3.2.3 Hog Sector

As discussed in the 2001 Notice, EPA is replacing the 1997 USDA data for hog operations used for proposal with other data obtained by the Agency since proposal (see 66 FR 58587-58588). For the hog sector, EPA is not using the financial data that it used for the proposal analysis because of concerns expressed by USDA and others through public comment on the 2001 Proposal. Such comments suggest that the 1997 data are not representative because they reflect conditions where hog prices were unusually high. For the final analysis, EPA uses alternative farm level and enterprise level data from USDA based on a special USDA survey of the hog sector in 1998 (USDA/ERS, 2002a—DCN 375064), with modifications by EPA as summarized here. A summary of the farm level and enterprise level input data that EPA uses for its analysis is presented in Tables 2-2 and 2-3.

The alternative 1998 USDA data for the hog sector have the advantage of providing both farm level and enterprise level data from a single data source. Another advantage of using USDA's data is that these data are based on an actual producer survey. As with all other data provided by USDA, these data were compiled by USDA's ERS for EPA's use and were sufficiently aggregated to mask any confidential business information. Given the availability of this single and up-to-date data source, EPA decided to use these data instead of a compilation of farm level data from the 1997 ARMS data set from USDA used for the proposal analysis (USDA/ERS, 1999a), along with enterprise level data submitted by FAPRI (FAPRI, 2001a—DCN 175038). The alternative USDA and FAPRI were presented in the 2001 Notice (66 FR 58588-58589), soliciting further public comment on their use for this analysis. The alternative 1998 USDA data were further discussed in the 2002 Notice (see 67 FR 48108 and DCN 375084) and available for public review in the rulemaking record.

The 1998 USDA data have the added advantage of providing broader coverage of the hog sector because these data cover a broader range of hog production types, including both farm and enterprise level conditions across three types of operations: independent owner-operator farrow-finish and farrowing operations, contract grow-finish operations, and independent grow-finish operations. (Financial data for farrow-finish contract operations are not available from USDA because of small sample size.) By contrast, the 1997 USDA hog data represent average conditions across all types of operations; the FAPRI reflect independent farrow-finish operations only. FAPRI's data also do not include farm level financial data. Although the USDA data reflect national and not regional conditions, other data from USDA are available to distribute the types of operations—contract versus independent operations—by major production region (USDA/ERS, 1999a). EPA is therefore able to provide region-specific model breakouts that account for the different proportions of contract versus independent operations across two of its CAFO model regions (Mid-Atlantic and Midwest).

As EPA had anticipated in its 2001 Notice, initial data obtained by the Agency from USDA could not be readily analyzed. Since the publication of the Notice, EPA has been working with USDA to resolve these issues and obtain additional data. Since the publication of the 2001 Notice, EPA has obtained data from USDA that report farm income excluding non-cash items, which USDA had included in the original submittal of these data. USDA's new submittal also includes corresponding farm level data. These data are available in the rulemaking record (USDA/ERS, 2002a—DCN 375064). The

rulemaking record also contains additional information documenting how EPA has worked with USDA to obtain alternative data since the 2001 Proposal (see: USEPA, 2002b, 2002c, 2002d, 2002f, 2001c, 2001d; USDA/ERS, 2002a, 2002b, 2002c, 2002d, 2001, 2001a, 2001b, 2001c, 2001d; ERG, 2002c; ERG and DPRA, 2001).

Because of persistently negative net cash income due to 1998 market conditions in the hog sector, EPA is unable to readily analyze these data for its analysis and considered additional modifications to the data obtained by USDA. Modifications to these data by EPA include (1) averaging conditions over 5 years using available USDA data on farm costs and returns at hog farms; (2) adjusting these data to reflect expected price rather than actual price for 1998 and 1999; and (3) making assumptions about farrow-finish operations in the Mid-Atlantic region that are counter to USDA's database. Other adjustments, consistent with those performed on data for each of the other livestock and poultry sectors analyzed, include projection of the base-year data across EPA's 10-year analysis period.

First, to average the available baseline farm level financial data over multiple years, EPA adjusts the 1998 data using published USDA cost and returns data for both farrow-finish and grow-finish operations. These data cover 1995 to 1999. For this analysis, EPA uses national level data to create an index to develop 5 years of farm level financial data from which to extrapolate the 1998 farm data. The 1998 data are extrapolated over the time frame by apportioning costs and revenues on the basis of changes in costs, revenues, and returns reported for 1995 through 1999. This type of adjustment is discussed in the 2001 Notice (66 FR 58590-58591) and it addresses comments received on the Proposal EA. This adjustment is made by averaging baseline conditions to better account for year-to-year variability and pricing cycles. Using this approach and USDA data, EPA obtains the average farm level revenue values that it uses for its sales test.

EPA's DCF analysis already incorporates changes over multiple years, spanning a 10-year time frame (1997 to 2006). This approach is consistent with that used for the 2001 Proposal. However, net cash income reported by USDA for hog enterprises in 1998 continues to be negative in some cases. When these 1998 values are extrapolated to the 1995 to 1999 time period, as is done for the farm level data, cash flow on average over this 5-year period continues to be negative for some representative facilities. The primary reason for these negative income values is that 1998 was a year in which hog prices dropped dramatically. At the farm level, USDA-reported net cash income is positive, although likely low when compared to other years.

Second, the principal modification to these enterprise data by EPA is the adjustment of the data to reflect expected price rather than actual price for 1998 and 1999. (EPA does not adjust USDA-reported farm level data since the Agency can analyze these data without adjustment.) EPA assumes this resultant expected price to adjust the 1998 data provided to the Agency by USDA. The method EPA uses is based on an approach recommended by USDA ERS personnel. This recommended approach uses price projections from USDA's World Agricultural Supply and Demand Estimates (WASDE) published in 1997 as an indicator of expected 1998 price levels in the hog sector (USDA, 2001). Applying this approach provides an expected price of about \$47 per hundredweight (cwt.) across all hog operations for that year, compared to the actual price of less than \$35 per hundredweight reported in 1998. Another approach suggested by USDA uses historical data to compile a ratio of hog prices to corn prices (see ERG, 2002c). This approach adjusts reported 1998 hog revenues upward by roughly 15 percent, but applying this approach results in consistently negative net cash income values for enterprises with fewer than 1,000 AU. A detailed summary of how EPA adjusts the available hog data obtained from USDA is available in the record (ERG, 2002a—DCN 375083).

EPA uses the resultant expected price for 1998 to adjust the enterprise level data provided by USDA. Once the 1998 enterprise level data are adjusted, EPA derives a base year estimate by back-calculating to 1997 using a 5-year index that EPA created based on the same USDA national level cost and returns data for farrow-finish and grow-finish operations from 1995 to 1999 as are used to extrapolate farm level revenues. EPA replaces the USDA-reported data for 1998 and 1999 with EPA-adjusted values based on the expected market prices during this period. The adjusted base-year enterprise level net cash income values are presented in Table 2-3 and are the data EPA assumes for its analysis. (Table 2-5 shows specific line item definitions.) EPA presented the results of these adjustments of the original data to USDA ERS personnel, who reviewed the approach and resultant adjustments to these data (USEPA, 2002f; USDA/ERS, 2002d).

EPA defends its decision to adjust the 1998 USDA hog financial data to reflect expected price rather than actual price for 1998 and 1999. As discussed in the Proposal EA, hog prices during this period were uncharacteristically low and the result of excess supplies due to overproduction and overcapacity in this sector. Since this time, hog prices have recovered to more closely reflect average historical price levels. Adjustments for “expected price” are also consistent with economic theory and are generally recognized as valid techniques among economists, and are commonly employed in applied research to obtain representative average and usable data for conducting policy analysis. The techniques employed by EPA are consistent with those employed by researchers at USDA, industry, and the land grant universities. In fact, the approaches used by EPA to adjust these data are precisely those recommended by researchers at USDA and were reviewed by USDA prior to use in the Agency’s economic model (see DCN DCN 375083 AND DCN 375094). The approach used by EPA is consistent with previous data adjustments made by the Agency to adjust data for use in other regulatory analyses to make data reflect average and, in some cases, more realistic conditions, where other data are not available. Finally, adjustment of the original USDA data is necessary since without such adjustments, these data show persistently negative net cash income due to 1998 market conditions in the hog sector and EPA is unable to readily analyze these data for its analysis. No other data are available for EPA to conduct its analysis (see response to comment DCN CAFO400165-36). Without EPA’s adjustments to these data, these data show persistently negative net cash income due to 1998 market conditions in the hog sector and EPA is unable to readily analyze these data for its analysis. Without these adjustments or other available data, this would require that EPA regard these operations as “baseline closures” and remove them from the analysis. As discussed in the 2001 Notice (66 FR 58579), where data show that a regulated facility would not normally be financially viable, it is EPA’s longstanding practice to assume the operation is a baseline closure for purpose of its analysis and remove the facility from subsequent analysis. Because EPA is using a representative farm approach and grouping several operations under a certain representative model groupings, the Agency decided not to assume that any existing CAFOs would constitute baseline closures and thus be removed from the analysis.

EPA conducted two sensitivity analyses using alternative hog sector data and assumptions. One analysis compares the results of the Agency’s main analysis using new farm and enterprise level data from USDA (as adjusted by EPA using WASDE data) against the results of an alternative analysis using other enterprise level data submitted by FAPRI. A second sensitivity analysis compares the results of its main analysis against USDA’s data under alternative expected price adjustments based on the ratio of hog to corn prices (using the approach discussed previously; see also ERG, 2002a). The results of the analysis using alternative data for operations with more than 1,000 AU indicate that EPA’s analysis results are stable across a range of input data. The results of the sensitivity analysis using alternative adjustments for expected price are indeterminate among operations with fewer than 1,000 AU since the baseline data for many of these operations indicate negative cash flow and would likely be considered as baseline closures by EPA (ERG, 2002c—DCN 375111).

EPA projects the 1997 baseline data using FAPRI timeline data of net returns for the hog sector to obtain a cash flow stream over the analysis period (1997 to 2006). See Table 2-4 (FAPRI, 2001c, 2001d). From these data, EPA estimates the net present value of expected cash flow for use in its DCF analysis. A summary of these values at both the farm level and enterprise level is presented in Tables 2-6 and 2-7.

Finally, USDA's financial data indicate that there are few (less than 4 percent) farrow-finish independent operations in the Mid-Atlantic region. This means that USDA is unable to provide financial data, given too small a sample size. Because these data are not available, EPA uses available national level data for farrow-finish independent operations to depict conditions for these types of operations in this region. However, EPA's interpretation of other USDA information, which the Agency uses to develop its engineering cost estimates, indicates that there is potentially a much greater share of farrow-finish operations in this region. Because this issue cannot be readily clarified, EPA uses the available financial data for farrow-finish independent operations, which is matched up against cost model data and information depicting the number of farrow-finish contract operations in this region.

For the debt-asset test, EPA uses FAPRI data on total assets and total liabilities for operations of similar size in this sector (FAPRI, 2001a), replacing the USDA asset and liability data used for proposal. Use of the alternative data addresses concerns expressed during the public comment period about EPA's assumptions of baseline debt and equity conditions at CAFOs and the data on debts and assets assumed for the proposed rulemaking (see: 2001 Notice, 66 FR 58582-58583). These FAPRI data exclude smaller sized, typically older, operations that may carry less debt, and focus on larger sized facilities that are often more capital-intensive or might be seeking to expand, thus requiring additional capital investment. EPA uses the FAPRI debt and asset data for its debt-asset test, instead of USDA data, since FAPRI's data are likely more representative of the debt load and size of operation affected by the final regulations.

For more information, refer to EPA's Comment Response Document available in the record for the Agency's response to comments on the financial data used to depict financial conditions for this sector, as well as other responses to comments about the financial tests used to evaluate this rule.

2.3.2.4 Poultry Sector

For the poultry sectors, EPA continues to use the 1997 USDA farm level data for broiler, egg-laying, and turkey operations, which the Agency used for the proposal analysis. Since proposal, additional farm level data for these sectors have not been made available. EPA also continues to use 1997 USDA data on total assets and total liabilities for the debt-asset test, which were used for proposal, since the Agency was unable to obtain alternative debt and asset data for these sectors. A summary of the farm level and enterprise level input data that EPA uses for its analysis is presented in Tables 2-2 and 2-3.

For the enterprise level analysis, EPA uses enterprise budget data compiled by various land grant universities. For broiler operations, EPA uses enterprise budgets reported by Oklahoma State University (1997), presented in the 2001 Notice (DCN 175024). These budgets reflect conditions at a contract grower operation. The data compare favorably to enterprise budget data published by other land grant universities for a contract broiler operation. See Georgia University (Cunningham, 2001), North Carolina State University (1993), and University of Arkansas (2000). EPA uses the 1997 data from Oklahoma State University because these data correspond to the base year of the Agency's analysis time frame (1997).

The 2001 Notice presented enterprise budget data for broiler operations. As anticipated by EPA in its 2001 Notice, the Agency compiled additional enterprise level data for egg-laying and turkey operations. Despite an extensive search of available land grant university data, EPA was able to locate only a single source for enterprise budgets for the egg-laying and turkey sectors. For turkey operations, EPA identified two enterprise budgets (one for hens and one for toms, which EPA averaged) for a contract grower operation (North Carolina State University, 1997). For egg-laying operations, EPA identified an enterprise budget for an independent-owner operation (Iowa State University, 1999). These data are available in the rulemaking record (see: DCN 375036, DCN 375048, and DCN 375049).

Available enterprise data do not capture each of the possible types of poultry operations, including whether an operation is independently-owned and operated or whether the operation raises animals under contract. Given that EPA has been unable to locate additional financial data for all types of operations, the Agency is unable to directly evaluate regulatory impacts at each type of operation. The enterprise data for broiler and turkey operations are for contract operations only; data are not available for independent owner-operators in these sectors. Enterprise data for layer operations are for an independent owner operations only; data are not available for operations that raise eggs under contract.

As noted in the Proposal EA, the overall financial conditions might differ depending on whether the operations raises animals independently or under contract. Gross farm revenues generated by contract growers tend to be lower than those of independent operators because the contract price is often lower than the market price received by independent operators; however, the contract grower typically faces lower production costs because the processor supplies much of the contract grower's production input. Also, a grower operation's current assets might be lower because these operations do not own the chickens they grow or produce crops requiring storage (Perry et al., 1999). Because production costs at contract operations are typically lower compared to independent operations, cash flow per bird is likely not substantially different. Therefore, EPA believes that the results of its cash flow analysis at either the farm level or the enterprise level will not be different in terms of number of number of business closures under a post-regulation scenario. Debt-to-asset ratios are also expected to be similar between contract and independent operations of similar size, since most contract operations own their own infrastructure.

EPA has further evaluated the potential implications of using the available data despite their limitations. EPA believes that lack of contract grower information for broiler and turkey operations does not substantially affect the results of its analysis of these sectors. First, the use of data for a contract operation to evaluate independent-owner operations may generally be considered a conservative source of data for assessing potential effects. Second, the available data reflect the dominant operation type in these sectors. USDA data indicate that nearly all broilers are raised under contract. This is based on data showing that 98 percent of birds produced are not owned by the farmer. Similar data for the turkey sector indicate that 70 percent of turkeys are produced under contract. Because EPA's analysis assumes that all (100 percent) broiler and turkey operations are contract grower operations, the results of EPA's analysis might be overstated. Because contract operations tend to have less available income to pay for compliance costs, as compared to independents, EPA's analysis might show a greater number of potential closures than is actually the case.

For the egg-laying sector, however, EPA uses enterprise budgets for independent operations across all operation, including contract grower operations, which could understate regulatory impacts to those operations that raise eggs under contract using the Agency's sales test (if these contract operations generate lower revenue per bird than independent operations). Information from USDA indicate that 87 percent of operations with more than 1,000 AU are independent operations and 60 percent of operations

with more than 300 AU are independent operations.⁷ Although EPA believes that use of these data would not substantially affect its cash flow analysis results because production costs at contract operations are typically lower compared to independent operations (and, therefore, cash flow per bird might not be substantially different between independent and contract operations), the Agency has conducted further review of these data.

To evaluate how limited data in the egg-laying sector might influence the results of EPA's analysis, the Agency conducted additional sensitivity analyses of these data by comparing the results of its analysis using available data with adjustments to approximate conditions at contract grower operations (ERG, 2002c—DCN 375111). This sensitivity analysis uses enterprise budget data for independent-owner operations, which are adjusted by USDA information on the share of operations that are contract growers versus independents and by USDA information about the livestock portion of total farm revenue generated at egg operations (USDA/ERS, 1999a).

EPA conducts this analysis as follows. Among larger-sized operations with dry manure systems, EPA assumes that contract growers account for 13 percent of all operations and generate 10 percent of the reported livestock portion of total farm revenue for egg operations. Among smaller-sized operations with wet manure systems, EPA assumes that contract growers account for 40 percent of all operations and also generate 10 percent of the reported livestock portion of total farm revenue for egg operations. More information is available in the rulemaking record (see ERG, 2002c—DCN 375111). The results of this sensitivity analysis show that under these assumptions no egg operations would go out of business, which is consistent with the results of the main analysis (see Section 3.3 of this report). This analysis shows that use of these alternative data and assumptions should not affect the results of EPA's analysis. EPA believes that this finding would not change its assessment of the economic achievability of the CAFO regulations.

Because only limited poultry data are available, EPA has not been able to locate multiple years of financial data to average available data over a multiple year time frame. Therefore, EPA's analysis of the financial effects on broiler, egg, and turkey operations is based on a single year of input data. Using available data, EPA obtains net cash income estimates at both the farm and enterprise levels. EPA projects out the 1997 baseline data using FAPRI timeline data of net returns for the broiler, egg-laying, and turkey sectors to obtain a cash flow stream over the analysis period (1997 to 2006). See Table 2-4 (FAPRI, 2001c, 2001d). From these data, EPA estimates the net present value of expected cash flow for use in its DCF analysis. A summary of these values at both the farm level and enterprise level is presented in Tables 2-6 and 2-7.

For more information, refer to EPA's Comment Response Document available in the record for the Agency's response to comments on the financial data used to depict financial conditions for this sector, as well as other responses to comments about the financial tests used to evaluate this rule.

2.3.3 Matching of EPA Cost Models and EPA Financial Models

To facilitate the linking of the cost and financial models developed for this analysis, EPA expresses all cost model outputs and financial variable inputs on a per-animal (inventory) basis. This

⁷ Assessed by USDA assuming 100,000 birds equals 1,000 AU.

allows EPA to compare estimated costs and baseline financial conditions across representative CAFO models that reflect varying facility sizes, producing regions, land availability, and facility types. This process is described in greater detail in the Proposal EA. EPA's cost models are described in Section 2.2, and more detail is provided in EPA's *Development Document* (USEPA, 2002).

To match up and establish consistency between the cost and financial models, EPA scales the financial data using the same number of animals assumed for each of the cost models, whose estimated compliance cost outputs also are expressed on a per-animal (inventory) basis. This intersection of financial models and cost models forms the basis for EPA's regulatory analysis using the representative farm approach. Table 2-1 shows the underlying assumptions of the average animal inventory for each CAFO model. Multiplying the average animal inventory estimates (shown in Table 2-1) by the financial data derived on a per-animal basis (shown in Tables 2-2 and 2-3) allows EPA to match up available cost and financial models for the purposes of this analysis. The baseline financial models that EPA uses for its analysis assume gross facility revenue and net present value of cash flow. This baseline depiction reflects the product of the average inventory assumptions and financial data derived on a per-animal basis shown in the tables.

This approach allows for greater accuracy by aligning the compliance costs incurred and revenues generated at a facility, allowing EPA to account for the single largest variable in its analysis—the number of animals raised at the facility. This approach also allows for greater flexibility because EPA can readily use available financial data for one CAFO model as a substitute for another where data are not available simply by adjusting the number of animals at a facility (assuming that per-unit costs and revenues between these representative facilities may be considered similar).

Agriculture sector research routinely expresses costs and revenues as a unit metric, such as dollars per animal or dollars on a unit weight basis. Expressing an increase in production costs on a per unit basis provides a quick assessment of the potential effects of such increases on a farming operation, often without further analysis. For example, to evaluate a range of technology options to regulate hog producers in North Carolina, researchers at North Carolina State University (NCSU) have established a cutoff of \$3 to \$5 per marketed hog as being “economically feasible,” implying that per-head costs in excess of that threshold might be prohibitive (NCSU, 1999). EPA's estimates of per-animal costs for the final regulations are provided in Appendix B for each of the commodity sectors.

As noted in Section 2.2.1, the CAFO models EPA uses for this analysis represent the interface between a large number of cost models and a smaller number of financial models. The cost models are able to account for greater variability among operations, compared to the financial models, including differences by production types, geographic conditions and production region, land availability, technology needs, and the like. In some cases, available financial data do not match each possible permutation among all possible production cost structures (as discussed in Section 2.2.1).⁸ Fewer financial models are developed because of limited data on financial conditions across all CAFOs. In other cases, however, the available financial data might more precisely reflect an operation's business type, including whether the operation is a contract grower or independent owner-operator, as well as (in more limited cases) whether the operation is reflective of a corporate structure. These types of

⁸In some cases, EPA decided to use national average available data despite limited available regional data, for reasons explained in Section 4 of the Proposal EA.

circumstances might have more bearing on the regulatory effects on an operation than the operation's cost structure.

Given that EPA has accounted for the single largest variable in its analysis—the number of animals raised at the facility—and given the use of available average financial data differentiated by sector and in some cases by size and business type, EPA believes that this approach reasonably approximates average financial conditions across all types of operations.

Alternative data obtained by EPA since proposal represent an important improvement to the economic analysis. EPA has obtained additional information differentiating between independent owner-operation and contract grower operations in the hog and poultry sectors. At proposal, EPA used available financial data for an entire sector that did not, in some cases, reflect differences in financial conditions across different business types, including whether the operation markets animals it owns (e.g., independently owned and operated farms) or raises animals on behalf of a corporate entity that typically retains ownership of the animals (e.g., contract grower). New data obtained for the hog sector also depict differing conditions among farrow-finish and grow-finish operations. Other new data depict enterprise budgets for replacement heifer operations. EPA's model still is unable to reflect conditions specific to veal operations. EPA's model also is not able to account for possible financial differences among egg laying operations (wet versus dry manure management systems). Other limitations regard the availability of data for the poultry sector to fully indicate all cases of whether the operation is an independent-owner operation or raises animals under contract (see discussion in Section 2.3.2.4).

As described in Section 2.4 of this report, EPA uses additional alternative data to expand upon its analysis to further evaluate regulatory effects at an operation's livestock or poultry enterprise. This approach builds upon the 2001 Proposal analysis, which evaluates financial effects at regulated CAFOs using financial data for an operation as a whole. That is, the analysis now includes revenue generated at a facility from other non-livestock and farm-related enterprises at the operation, and it counts among an operation's total farm income the revenue from the sale of livestock, crops, and other farm-related income, as well as government payments. Historically, most effluent guideline regulations have used broader facility level data, with the exception of only a limited number of cases (e.g., see USEPA, 1996). Given the availability of additional data that EPA has obtained since proposal, the Agency is able to account for potential facility closures as well as potential product line closures, as represented by the representative model CAFOs developed by EPA for this analysis.

Table 2-1. Model CAFO Assumptions by Sector, Size, and Region (Size Range and Average Inventory)

Sector	Region	Medium 1	Medium 2	Medium 3	Large 1	Large 2
		300-1000 AU			>1,000 AU	
Fed Cattle	MW,CE,PA,SO,MA	300-499 (370)	500-749 (552)	750-999 (766)	1,000-8,000 (1,839)	>8,000 (25,897)
Veal	MW,CE,PA,SO,MA	300-499 (400)	500-749 (540)	750-999 (1,080)	>=1,000 (1,080)	
Heifers	MW,CE,PA,SO,MA	300-499 (400)	500-749 (625)	750-999 (875)	>=1,000 (1,500)	
Dairy	MW,CE,PA,SO,MA	200-349 (250)	350-524 (425)	525-699 (600)	>=700 (1,430)	
Hog: FF	MA	750-1249 (940)	1250-1874 (1,439)	1875-2499 (2,004)	2500-5000 (3,686)	>5,000 (11,231)
	MW	750-1249 (921)	1250-1874 (1,415)	1875-2499 (1,987)	2500-5000 (3,280)	>5,000 (10,300)
Hog: GF	MA	750-1249 (940)	1250-1874 (1,439)	1875-2499 (2,004)	2500-5000 (3,686)	>5,000 (11,231)
	MW	750-1249 (921)	1250-1874 (1,415)	1875-2499 (1,987)	2500-5000 (3,280)	>5,000 (10,300)
Hog: FF	CE				2500-5000 (3,601)	>5,000 (16,946)
Hog: GF	CE				2500-5000 (3,601)	>5,000 (16,946)
Layers: Wet	SO			9,000-29,999 (19,500)	>= 30,000 (146,426)	
Layers: Dry	MW	30,000-49,999 (38,209)	50,000-74,999 (61,734)	75,000-99,999 (90,367)	100,000-600,000 (349,999)	>600,000 (856,367)
	SO	30,000-49,999 (38,209)	50,000-74,999 (61,734)	75,000-99,999 (90,367)	100,000-600,000 (349,999)	>600,000 (856,367)
Broilers	MA	30,000-49,999 (37,248)	50,000-74,999 (56,469)	75,000-99,999 (79,454)	100,000-180,000 (126,565)	>180,000 (254,390)
	SO	30,000-49,999 (36,792)	50,000-74,999 (56,130)	75,000-99,999 (79,364)	100,000-180,000 (124,448)	>180,000 (228,091)
Turkeys	MA	16,500-27,499 (22,246)	27,500-38,499 (34,640)	38,500-54,999 (47,534)	>=55,000 (127,396)	
	MW	16,500-27,499 (22,246)	27,500-38,499 (34,640)	38,500-54,999 (47,534)	>=55,000 (127,396)	

Source: USEPA, 2002. Values shown in parentheses are the average number of animals (inventory) assumed for each model CAFO. Values shown are averaged across all cost categories (based on land use and technology needs) for the P-based land application standard. See *Development Document* (USEPA, 2000). Shaded cells indicate model CAFO not developed. EPA's model regions: Midwest (MW); Central (CE); Pacific (PA); Mid-Atlantic (MA); South (SO) (vary by sector, see USEPA, 2002). FF: farrow-finish; GF: grow-finish.

Table 2-2. Financial Input Data, Farm Level

Sector Size (AU)	Reg.	Gross Revenue	Net Cash Income	Deprec.	Operating Cost	Debt-Asset	Source/Description	
		(\$ per head inventory)						(%)
Beef, Veal, & Heifers Operations								
>1000	All	\$475	\$9	\$5	\$461	68%	NCBA 2001 (1997-1999) U.S. 52,000 head.	
<1000	All	\$945	\$2	\$5	\$913	68%	FAPRI 2001a (2000-2002). Midwest 500-head.	
Dairy Operations								
>1000	MW	\$1,746	\$269	\$144	\$1,319	64%	USDA 2002 (2000 data) Revenues avg. 1991-2000 using USDA/ERS 2002b. Debt/asset: FAPRI 2001 (2000).	
	PA	\$1,764	\$230	\$202	\$1,374	64%		
<1000	MW	\$2,492	\$631	\$158	\$1,635	62%		
	PA	\$1,841	\$405	\$117	\$1,269	62%		
Hog Operations (GF/contract)								
>1000	All	\$32	\$9	\$6	\$20	65%	USDA 2002a (1998 data) U.S. >1,000AU; 300-1,000 AU. Averaged 1995-1999 using USDA ERS, 2002b Debt/asset: FAPRI 2001a (2000).	
<1000	All	\$244	\$38	\$15	\$192	49%		
Hog Operations (GF/independent)								
>1000	All	\$163	\$29	\$9	\$124	65%		
<1000	All	\$251	\$42	\$16	\$194	49%		
Hog Operations (FF & farrowing/independent)								
>1000	All	\$143	\$18	\$12	\$112	65%		
<1000	All	\$204	\$42	\$17	\$141	49%		
Broiler Operations (average all operations, independent and contract)								
>1000	MA	\$1.13	\$0.50	\$0.17	\$0.44	30%	USDA 1999a (1997)	
	SO	\$1.16	\$0.50	\$0.17	\$0.47	26%		
<1000	MA	\$1.47	\$0.60	\$0.18	\$0.67	21%		
	SO	\$1.42	\$0.60	\$0.18	\$0.64	19%		
Layer Operations (average all operations, independent and contract)								
All	All	\$24.63	\$4.10	\$2.60	\$16.74	11%	USDA 1999a (1997)	
Turkey Operations (average all operations, independent and contract)								
>1000	All	\$20.08	\$1.80	\$0.88	\$17.29	15%	USDA 1999a (1997)	
<1000	All	\$11.24	\$2.60	\$0.90	\$7.20	23%		

Table 2-3. Financial Input Data, Enterprise Level

Sector Size (AU)	Reg.	Net Cash Income	Depr./Cap. Recov.	Operating Cost	Source/Description	
		(\$ per head inventory)				
Beef & Veal Heifer Operations						
>1000	All	\$9	\$5	\$461	Same as farm level (see Table 1)	
<1000	All	\$2	\$5	\$913	Same as farm level (see Table 1)	
Heifer Operations						
All	All	\$136	\$63	\$903	University of Idaho (1998 data) Average of Jersey and Holstein budgets.	
Dairy Operations						
>1000	MW	\$433	\$171	\$904	USDA 2002 (2000) Two regions: North (assumed for MW) & South (assumed for PA)	
	PA	\$295	\$222	\$1,136		
<1000	MW	\$356	\$525	\$1,100		
	PA	\$372	\$232	\$1,006		
Hog Operations (GF contract)						
>1000	All	\$35	N/A	\$86	USDA, 2002a (1998 data) U.S., >1,000AU and 300AU-1,000 AU (Adjusted—see text and ERG, 2002a)	
<1000	All	\$14	N/A	\$94		
Hog (GF independent)						
>1000	All	\$18	N/A	\$104		
<1000	All	\$6	N/A	\$94		
Hog (FF/farrowing , independent)						
>1000	All	\$33	N/A	\$67		
<1000	All	\$4	N/A	\$73		
Broiler Operations (contract)						
All	All	\$0.15	\$0.05	\$0.09	Oklahoma State University, 1997	
Layer Operations (independent)						
All	All	\$2.85	\$0.60	\$10.19	Iowa State University, 1999	
Turkey Operations (contract)						
All	All	\$0.57	\$0.19	\$0.14	NCSU, 1997 Average of turkey tom and hen budgets	

Table 2-4. Baseline Projections, Returns Per Unit, 1997-2006

Sector/ Year	Beef	Dairy	Hogs	Broilers	Egg Layers	Turkeys
	(\$/cow)	(\$/cwt)	(\$/cwt)	(¢/lb)	(¢/doz)	(¢/lb)
1997	\$21.78	\$11.62	\$10.62	5.81	9.10	(3.80)
1998	(\$4.48)	\$12.41	\$2.20	14.26	10.12	0.08
1999	\$9.52	\$9.85	\$1.79	11.81	3.21	11.83
2000	\$4.36	\$9.83	\$13.93	9.21	5.63	12.11
2001	\$14.82	\$10.46	\$15.33	11.99	4.89	7.89
2002	\$30.08	\$10.89	\$13.78	12.21	0.65	7.90
2003	(\$4.36)	\$11.05	\$9.06	11.87	3.61	8.49
2004	\$26.59	\$11.28	\$10.93	11.68	5.45	8.98
2005	\$29.20	\$11.48	\$12.09	11.54	6.94	8.87
2006	(\$6.54)	\$11.69	\$13.05	10.87	7.15	8.37

Sources: Cattle (NCBA, 2001); Dairy (USDA/WAOB, various years), and Hog/Poultry (FAPRI, 2001c, 2001d).

Table 2-5. Net Cash Income Components from Available Data

Data source	Sector	Data Type	Net Cash Income Components
1997 ARMS (USDA/ERS, 1999a)	Poultry sectors	Farm	Computed by USDA as gross cash income less variable and fixed cash expenses (see Proposal EA, USEPA, 2001a)
1998 ARMS (USDA/ERS, 2002a, 2002c)	Hog and dairy sector	Farm and enterprise	Farm net cash income computed by USDA as net cash farm income (gross cash income minus total cash expenses); enterprise net cash income computed as USDA-provided gross sales minus USDA-provided cash expenses (excl. operating interest, considered an opportunity cost by USDA).
FAPRI (2001a)	Cattle sectors (<1000 AU)	Enterprise	Computed by FAPRI using revenues minus operating costs, operating and fixed interest, and cash overhead items such as office supplies and property taxes.
NCBA (2001)	Cattle sectors (>1000 AU)	Enterprise	Computed by NCBA as revenues minus operating costs plus interest income minus interest expenses.
Enterprise budgets (various)	Heifer, broiler, layer, and turkey sectors	Enterprise	All cash items, both fixed and variable (including operating interest) identified and subtracted from revenues. Depreciation excluded.

Table 2-6. Projected Cash Stream for Farms (1997-2006) Based on Projections of Per-Unit Returns

Sector	Region	Size	Base Year Net Cash Income	Cash Stream (1997-2006)										NPV
				1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	
Beef	US	L	\$22	\$22	(\$4)	\$10	\$4	\$15	\$30	(\$4)	\$27	\$29	(\$7)	\$83
Beef	US	M	\$2	\$19	(\$7)	\$7	\$2	\$12	\$28	(\$7)	\$24	\$27	(\$9)	\$65
Dairy	MW	L	\$269	\$571	\$704	\$272	\$269	\$342	\$369	\$407	\$441	\$477	\$370	\$3,023
Dairy	PA	L	\$230	\$532	\$665	\$233	\$230	\$303	\$330	\$368	\$402	\$438	\$331	\$2,749
Dairy	MW	M	\$631	\$933	\$1,066	\$634	\$631	\$704	\$731	\$769	\$803	\$839	\$732	\$5,565
Dairy	PA	M	\$405	\$707	\$840	\$408	\$405	\$478	\$505	\$543	\$577	\$613	\$506	\$3,978
Hog FF	US	L	\$18	\$55	\$18	\$17	\$48	\$52	\$48	\$36	\$41	\$44	\$46	\$280
Hog FF	US	M	\$42	\$99	\$42	\$38	\$70	\$73	\$69	\$57	\$62	\$65	\$67	\$454
Hog GF Ind.	US	L	\$29	\$58	\$29	\$5	\$36	\$40	\$36	\$24	\$29	\$32	\$34	\$229
Hog GF Ind.	US	M	\$42	\$87	\$42	\$6	\$37	\$41	\$37	\$25	\$30	\$33	\$35	\$274
Hog GF Contr.	US	L	\$9	\$17	\$9	\$5	\$36	\$40	\$36	\$24	\$28	\$31	\$34	\$173
Hog GF Contr.	US	M	\$38	\$80	\$38	\$3	\$34	\$38	\$34	\$22	\$27	\$30	\$32	\$248
Broilers	US	L	\$0.50	\$0.50	\$2.30	\$1.78	\$1.22	\$1.81	\$1.86	\$1.79	\$1.75	\$1.72	\$1.58	\$11.25
Broilers	US	M	\$0.60	\$0.60	\$2.40	\$1.88	\$1.32	\$1.91	\$1.96	\$1.89	\$1.85	\$1.82	\$1.68	\$11.95
Broilers	SO	L	\$0.50	\$0.50	\$2.30	\$1.78	\$1.22	\$1.81	\$1.86	\$1.79	\$1.75	\$1.72	\$1.58	\$11.25
Broilers	SO	M	\$0.60	\$0.60	\$2.40	\$1.88	\$1.32	\$1.91	\$1.96	\$1.89	\$1.85	\$1.82	\$1.68	\$11.95
Layer	US	All	\$4.1	\$4.1	\$4.3	\$2.8	\$3.4	\$3.2	\$2.3	\$2.9	\$3.3	\$3.6	\$3.7	\$23.9
Turkey	US	L	\$1.8	\$1.8	\$2.6	\$5.1	\$5.2	\$4.3	\$4.3	\$4.4	\$4.5	\$4.5	\$4.4	\$28.1
Turkey	US	M	\$2.6	\$2.6	\$3.4	\$5.9	\$6.0	\$5.1	\$5.1	\$5.2	\$5.3	\$5.3	\$5.2	\$33.7

Source: Derived by EPA using cost and returns data from USDA (1999a, 2002a and 2002c), FAPRI (2001a), and NCBA (2001), along with projections from USDA/WAOB (various years), FAPRI (2001c, 201d), and NCBA (2001). Rounded to nearest dollar (beef, dairy, hogs), nearest 10 cents (layers and turkeys), or nearest cent (broilers). Base year of net cash income is either reported or projected to 1997.

Table 2-7. Projected Cash Stream for Enterprises (1997-2006) Based on Projections of Per-Unit Returns

Sector	Region	Size	Base Year Net Cash Income	Cash Stream (1997-2006)										NPV
				1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	
Beef	US	L	\$22	\$22	(\$4)	\$10	\$4	\$15	\$30	(\$4)	\$27	\$29	(\$7)	\$83
Beef	US	M	\$2	\$19	(\$7)	\$7	\$2	\$12	\$28	(\$7)	\$24	\$27	(\$9)	\$65
Heifer	US	All	\$136	\$162	\$136	\$150	\$145	\$155	\$171	\$136	\$167	\$170	\$134	\$1,070
Dairy	MW	L	\$433	\$735	\$868	\$436	\$433	\$506	\$533	\$571	\$605	\$641	\$534	\$4,174
Dairy	PA	L	\$295	\$597	\$730	\$298	\$295	\$368	\$395	\$433	\$467	\$503	\$396	\$3,205
Dairy	MW	M	\$356	\$658	\$791	\$359	\$356	\$429	\$456	\$494	\$528	\$564	\$457	\$3,634
Dairy	PA	M	\$372	\$674	\$807	\$375	\$372	\$445	\$472	\$510	\$544	\$580	\$473	\$3,746
Hog FF	US	L	\$33	\$69	\$33	\$18	\$50	\$53	\$49	\$37	\$42	\$45	\$47	\$313
Hog FF	US	M	\$4	\$31	\$4	(\$5)	\$26	\$30	\$26	\$13	\$18	\$21	\$24	\$128
Hog GF Ind.	US	L	\$18	\$41	\$18	\$4	\$35	\$39	\$35	\$23	\$28	\$31	\$33	\$199
Hog GF Ind.	US	M	\$6	\$23	\$6	(\$4)	\$27	\$31	\$27	\$15	\$19	\$22	\$25	\$129
Hog GF Contr.	US	L	\$35	\$63	\$35	\$19	\$50	\$53	\$49	\$37	\$42	\$45	\$48	\$310
Hog GF Contr.	US	M	\$14	\$35	\$14	\$2	\$33	\$37	\$33	\$20	\$25	\$28	\$31	\$177
Broilers	US	All	\$0.15	\$0.15	\$1.95	\$1.43	\$0.87	\$1.46	\$1.51	\$1.44	\$1.40	\$1.37	\$1.23	\$8.79
Layers	US	All	\$2.9	\$2.9	\$3.1	\$1.7	\$2.2	\$2.0	\$1.1	\$1.7	\$2.1	\$2.4	\$2.5	\$15.5
Turkeys	US	All	\$0.6	\$0.6	\$1.4	\$3.9	\$4.0	\$3.1	\$3.1	\$3.2	\$3.3	\$3.3	\$3.2	\$19.6

Source: Derived by EPA using cost and returns data from USDA (2002c), FAPRI (2001a), NCBA (2001), Oklahoma State University (1997), North Carolina State University (1997), and Iowa State University (1999), along with projections from USDA/WAOB (various years), FAPRI (2001c, 201d), and NCBA (2001). Rounded to nearest dollar (beef, dairy, hogs), nearest 10 cents (layers and turkeys), or nearest cent (broilers).

2.4 METHODOLOGY TO ASSESS IMPACTS ON MODEL CAFOs

For the 2001 Proposal, EPA developed a scheme to evaluate financial effects using 1997 USDA data based on a combination of farm's net income and debt-asset ratios to classify a representative farm's overall financial position based on annual earnings and solvency (USDA/ERS, 1997a, 1997e). See 66 FR 3079-3103. The analytical framework for the final rule retains the general modeling framework that EPA used to assess economic effects for proposal, with the modifications discussed in both the 2001 Notice and the 2002 Notice. Both Notices describe the range of methodological changes and financial data EPA has considered to improve its analysis.

This section describes the methodology that EPA uses to assess financial effects on regulated CAFOs, highlighting changes to this analysis since proposal. Section 2.4.1 presents the assessment criteria and key financial variables that EPA uses to assess post-compliance effects. Section 2.4.2 describes how EPA evaluates these assessment criteria to determine whether the estimated compliance costs are affordable, thus demonstrating the "economic achievability"⁹ of the final regulations. Section 2.4.3 discusses additional analyses performed by EPA, including an assessment of the regulatory effects that takes into consideration long-run market price adjustments, Federal and State cost-share assistance, and other cost offsets.

2.4.1 Assessment Criteria and Financial Data Variables

EPA's choice of criteria in any economic assessment of a regulation is variable and highly dependent on the industry being regulated. EPA recognizes that each industry has its own special attributes and requires an individual assessment of appropriate financial criteria. Therefore, EPA does not advocate a "one size fits all" benchmark for all industries but instead assesses each industry's general conditions and uses generally accepted analytical approaches for identifying economic impacts in each industry, if available, among other factors. Where appropriate, these other factors include criteria that have been developed to analyze other industries.

Federal agencies like EPA and USDA have been analyzing the impacts of regulatory requirements on regulated communities for many years. For example, the CWA, with its requirement to assess economic achievability, has prompted EPA since the early 1970s to analyze the economic and financial impacts of effluent guidelines on affected industries. Generally, EPA measures impacts using a variety of approaches that attempt to assess post-compliance changes in key financial variables. In many cases a benchmark is developed. This benchmark may be based on, for example, the lowest quartile performance of firms in the industry (e.g., USEPA, 1998b) or on an assessment of what has been generally accepted in past analyses or by the financial community, tempered by any specifics of the industry. Usually EPA uses more than one financial variable in an assessment because a single variable is rarely sufficient to fully describe the relative financial health of an affected entity.

For this rulemaking, EPA has selected criteria based on those commonly used in the agricultural sector to measure financial stress, in conjunction with criteria that the Agency has used in the past to

⁹ The Clean Water Act requires EPA to establish effluent limitations for point sources based on the "best available technology economically achievable" (Sections 301(b)(2)(A) and 304(b)(2)). Factors that EPA shall consider in an assessment of best available technology include the cost of achieving effluent reductions, among other factors (Section 304(b)(2)(B)).

determine the affordability of effluent guidelines developed for other industries. This analysis focuses on three financial criteria to assess whether the final CAFO regulations are affordable to affected businesses: (1) an initial screening comparing incremental pre-tax costs to total gross revenue (“sales test”), (2) projected post-compliance cash flow over a 10-year period (“discounted cash flow” [DCF] analysis), and (3) an assessment of an operation’s debt-asset ratio under a post-compliance scenario (“debt-asset test”). Financial data used for this assessment include total gross revenue for the sales test, net cash income for the DCF analysis, and debt-asset ratios for the debt-asset test. Each of these tests is conducted using available farm level financial data, with the exception of the DCF analysis, which is evaluated based on both farm level and enterprise level net cash income. Input data that EPA uses for this analysis are presented in Section 2.3 of this report.

For more information, see EPA’s response to comments regarding the financial data and the analytical approach that the Agency uses compile aggregate costs and to assess regulatory effects on CAFOs. These response to comments address recommended changes to EPA’s assessment approach, as well as the use of alternative data. Relevant response to comments in the Comment Response Document include adjustments to EPA’s assessment approach (see, for example, 202402-35 regarding its enterprise analysis, 400158-92 regarding adjustment to average out single year of data, 201352-101 on projections used, and adjustments and clarification on the assessment criteria used in 201352-35, 201335-104, 201438-207-1, 201335-104, 210352-106, and 201438-207-1) and EPA’s use of alternative best available data related to these adjustments (DCNs 201602-22, 400158-91, 400165-36, 202013-2, 201605-13 and 201352-108, 201352-136-4), among other Agency comment responses. The Comment Response Document available in the EPA’s rulemaking record.

2.4.1.1 Sales Test Using Gross Cash Income

EPA uses *gross cash income* to measure the ratio of compliance costs to sales (“sales test”). EPA uses pre-tax costs to evaluate a sales test because this approach is more consistent with the majority of previous analyses that use the threshold values assumed for this analysis (although previous ELG analyses have evaluated cost-to-sales ratios using both post-tax and pre-tax costs).¹⁰ The use of pre-tax revenue for the sales test represents a change from what EPA did for the Proposal EA, where post-tax revenues were analyzed for this criterion. This change addresses public comments received by EPA on the Proposal EA, as discussed in the 2001 Notice (see: 66 FR 58584-58585).

For this analysis, EPA uses average gross cash income expressed at the farm level. This measure includes total farm income from an operation’s livestock business as well as income from other sources, such as sales of crops and other secondary livestock on-site. Other farm-related revenue and government payments are also included. Table 2-2 lists the farm level revenue values that EPA assumes for this analysis.

EPA has often used a sales test to evaluate post-compliance impacts in previous regulatory analyses (USEPA, 1987, 1994, 1995, 1996, 1997, 1998a, 1998b, 1999a, 1999b, 2000b, 2000c, 2002h,

¹⁰Effluent guideline regulations that have been evaluated using post-tax costs include the Landfills, Commercial Hazardous Waste Combustors, and Centralized Waste Treatment industries. Pre-tax costs were used to evaluate the Pulp, Paper, and Paperboard, the Pesticide Formulating, Packaging and Repackaging, and the Metal Products and Machinery industries. EPA used both pre- and post-tax costs to evaluate the Transportation Equipment Cleaning industry.

2002g, 2002i; DPRA, 1993, 1995; USGPO, 1999). EPA's use of a sales test is also common practice when evaluating small business impacts for most regulatory development. Other agencies, including the Occupational Safety and Health Administration, also use a sales test (e.g., OSHA, 1999). USDA has also considered cost-to-sales impacts to evaluate impacts on animal confinement operations (Heimlich and Barnard, 1995). As noted in the Proposal EA, however, the sales test is not widely used to measure impacts in the agricultural sector (Foster, 2000). During the comment period, several commenters claimed that the sales test is not a useful measure of whether producers can afford the regulations. They suggested that it should be replaced with a rate of return measure, such as return on assets, equity, or investment. One commenter suggested a criterion based on cost as a percent of profit margin (measured as revenue less cost of goods sold) or gross margin (measured as returns to labor and overhead before taxes) (Iowa State University, 2001). Another commenter recommended evaluating profits measured as earnings before interest, taxes, depreciation, and amortization (EBITDA) (NCBA, 2001). Others indicated that the sales test, if retained, should be measured against a lower threshold value due to the lower profit margins on sales in agriculture. In general, commenters asserted that potential impacts, even at lower cost-sales ratios, can result in proportionately large reductions in net returns and erode the attractiveness of reinvestment in animal agriculture (NPPC, 2001). The 2001 Notice solicited comment on these and other alternative assessment criteria. More information is available in the record (ERG, 2001b). Overall, commenters expressed a preference that EPA evaluate compliance cost impacts using other income and profitability measures instead of a sales test. In part, this is already part of EPA's overall analysis, which includes an analysis of changes in discounted cash flow. See Section 2.4.1.2.

The Proposal EA describes as an alternative and common metric the examination of earnings before taxes as a percentage of gross income or revenues ("profit test"), where the change in ratio post-compliance is used as an indicator of the impact that compliance costs might have on profits. USDA's analysis (Heimlich and Barnard, 1995) measured economic achievability by comparing estimated regulatory costs with gross cash income (a sales test) and net farm income (a profit test), as well as cash operating expenses. In recent years, however, EPA has tended to move away from using net income analysis and profit tests as an indicator of the financial strength of a regulated entity for a number of reasons. First, many financial analysts now acknowledge that a net income analysis is a less accurate measure of financial health than a cash flow analysis because net income includes depreciation as a cost even though depreciation is not a cash outlay (see, e.g., Brigham and Gapenski, 1997). Also, for valuing corporate loans, the Financial Analysis Standards Board considers discounted cash flow the best estimator for assessing fair value for enterprises lacking a quoted market price (Jarnagin, 1996; FFSC, 1997, 2001). Second, profitability can be highly variable because a firm has a certain amount of leeway in calculating earnings in any given year to minimize tax liability. Privately held entities (which predominate in the livestock and poultry industries, for example) have few incentives to show large profits but every incentive to show minimal earnings for tax purposes. Third, if a large segment of an industry is showing negative net income, it is difficult to assess the impact of a regulation on profitability.

The problem with analyses based on profitability is especially important in the agricultural sector. Heimlich and Barnard (1995) point out that many farms "may be motivated by noneconomic considerations and should be considered hobby or recreational activities, rather than businesses, particularly when net farm income is negative." They further contend that most farm operators reporting negative net income have nonfarm sources of income and that they might be using the farm losses to offset off-farm income to reduce income tax liability. They also find, as does EPA, that when net farm income is

negative, costs as percentages of net income are difficult to interpret.¹¹ EPA, therefore, considers a sales test to be a more analytically useful tool than a profit test for assessing impacts in the livestock and poultry industries. First, EPA has concerns that profit-based measures might overstate vulnerability. Second, revenues are generally not as sensitive to incentives to show minimum values for tax purposes as profits and thus are not as likely as profits to be understated. Third, sales are never negative and thus a comparison between costs and sales can be adequately interpreted.

Given the boom and bust conditions common in the agricultural sectors, available financial data often show negative returns to risk, management, and unpaid labor. Consequently, the only way for EPA to conduct its analysis using these data is either to assume it is a baseline enterprise closure (i.e., it should not be considered in the regulatory analysis because the operation would be discontinued even without considering the impact of the regulations) or to determine that the operation cannot be analyzed at this level (i.e., the operation is remaining in business because of certain mitigating factors).¹² Information provided in the 2001 Notice indicates that some sectors would likely show large numbers of baseline closures given available data using a profit test with USDA definitions of net farm income (which includes depreciation and nonmoney expenses). Therefore, if the financial data for a certain representative group show negative returns under EPA's traditional approach, the Agency would need to consider all operations within a group as a baseline closure. For example, as discussed in the Notice, if EPA were to use alternative 1998 hog data from USDA, its traditional approach would assume that all operations in each of the representative groups are baseline closures. However, EPA recognizes that when available data show large numbers of baseline closures (including even whole sectors), this may indicate limitations with the underlying data or methodologies rather than a realistic picture of the industry. EPA is further aware that facilities identified as baseline closures under its traditional approach might be the very facilities likely to experience stress as a result of additional compliance costs and that it is therefore important to account for these facilities in the analysis.

For these reasons, EPA is maintaining use of the sales test and is not considering an alternative profitability measure for this criterion. However, to address comments on EPA's use of a sales test for the analysis, the Agency is clarifying that this test is primarily used as a first-level screen, indicating the need for further analysis, as discussed in more detail in Section 2.4.2.

EPA has made a number of changes in the way it evaluates this criterion. First, to address public comments on the use of financial data for this test, EPA uses alternative revenue data for the cattle and hog sectors (see Section 2.3). Second, EPA uses a sales test based on estimated pre-tax incremental cost, as opposed to costs that take into account potential tax savings (post-tax), which was assumed at proposal. More information is in EPA's response to comment DCN CAFO 201438-182. These pre-tax costs are

¹¹Typically, EPA considers that if a regulated entity is not profitable before pollution control investments are made, the entity "may not claim that substantial impacts would occur due to compliance..." (USEPA, 1995). In some cases EPA has used the concept of "baseline closure" if only a few entities have negative net income and cannot be analyzed (see, for example, USEPA, 2002h, 2001e, 2000c, 1998a, 1998b, 1997, and 1995). These entities might not necessarily close prior to implementation of a rule, but they cannot be analyzed within a profit test or net income analysis framework.

¹²Assumption of baseline closures is common practice in cases where EPA encounters such problems when analyzing certain multi-facility manufacturing or service firms using actual facility level data. In such cases the facility is removed from the analysis because it cannot be analyzed and is considered a baseline closure (see, for example, USEPA, 2002h, 2001e, 2000c, 1998a, 1998b, 1997, 1995).

compared to total farm level revenues, and that ratio is used as an initial screener to determine the need for additional analysis using EPA's discounted cash and debt-asset tests. Third, EPA's use of gross revenue now considers multiple years of data, where data are available, to derive a more representative average sales value for this test, rather than being based on a single year of data, as assumed at proposal. This approach uses available time series data from USDA to compile an index to project data over a longer time frame, linking up available financial data with other market and financial data for preceding and subsequent years (also for example, see: ERG and DPRA, 2001; ERG, 2002a). This approach, discussed in both of EPA's published Notices, is further discussed in Section 2.3 and documented in the record (ERG, 2002c; ERG and DPRA, 2001). More information is in EPA's response to comment DCN CAFO 400158-92. The DCF analysis spans a 10-year time frame (1997-2006) and uses time series projections, as discussed in Section 2.4.1.2, and thus already accounts for variability and changing conditions over multiple years. EPA is also expanding its DCF analysis to take into consideration enterprise level changes in profitability in addition to farm level effects (see Section 2.4.1.2).

For additional information about EPA's sales test, see response to comment DCN CAFO201352-35 in the Comment Response Document in the rulemaking record.

2.4.1.2 DCF Analysis Using Net Cash Income

The financial position of a farm can be calculated using either net cash income or net farm income. *Net farm income* is an effective measure of long-term profitability because it accounts for capital replacement costs and noncash business income (land, capital, and labor services). *Net cash income* reflects current or short-term cash earnings. For the purposes of this analysis, EPA uses cash-based measures (that is, the analysis is a net cash income-type analysis). The reported net cash income, or gross income less cash expenses, is used as an estimate of cash flow to construct a baseline per-animal annual cash flow. EPA conducts this analysis using both farm level and enterprise level financial data. Tables 2-2 and 2-3 list the baseline net cash income estimates for each sector that EPA assumes for this analysis. (See Table 2-5 for line item components assumed to define net cash income based on available data.)¹³ Tables 2-6 and 2-7 present the discounted cash flow values computed for this analysis.

A net cash income-type analysis is consistent with current views on the use of cash flow analysis in preference to net income analysis among financial analysts (Brigham and Gapenski, 1997; Jarnagin, 1996). Net cash income corresponds to total farm cash revenues minus cash expenses; that is, it is the agricultural term corresponding to the financial term "cash flow." A net cash income-type analysis differs from an evaluation of net farm income, which includes both noncash income and noncash expenses (e.g., depreciation) and corresponds to the term "net income" in accounting. This methodology estimates the long-term reduction in earnings that results from the costs of complying with the final regulations. If the post-regulatory status is less than or equal to zero, it does not make economic sense for the owner to upgrade the farm. Under these circumstances, the average farm represented by that model might be vulnerable to closure. (As explained in the Proposal EA, unlike previous regulatory analyses conducted by EPA, this approach does not consider the salvage value of liquidated assets at a CAFO.)

To account for changes in an operation's cash flow post-compliance, EPA estimates the present value of projected farm earnings, measured as a future cash flow stream in 1997 dollars. The present

¹³ This analysis does not consider noncash income and depreciation.

value of cash flow, also known as the discounted cash flow, or DCF, represents the value (in terms of today's dollars) of a series of future receipts. EPA calculates baseline cash flow as the present value of a 10-year stream of farm cash flow.

EPA projects future earnings over the period of the analysis (1997 to 2006) using net cash flow values derived on a per-animal basis. These values are measured at both the farm level and the enterprise level using available data, along with available projections of enterprise level earnings from 1997 through 2006, and other market data to translate projected per-unit returns to per-animal returns. EPA approximates future earnings using FAPRI's, NCBA's, or USDA's projected changes (expressed in dollars per unit) by applying the equivalent incremental change (expressed in dollars per animal) for each year during the forecast period (as presented in Section 4.2). EPA uses the resultant time series data to calculate the present value of net cash income used for this analysis. This approach is outlined below.

EPA projects the available base year (1997) farm level and enterprise level data (Tables 2-2 and 2-3) using projections from USDA, FAPRI, and NCBA. To translate available projections in net returns by sector (Table 2-4) on a per-animal basis, EPA uses available market information, such as average per-animal yields reported by USDA and/or annual marketing cycles based on industry data. For dairy, the 1997 average output of 16,781 pounds of milk per cow is assumed (USDA/NASS, 1999c). An average weight of 257 pounds per finished hog is assumed, based on reported weights for "swine for slaughter" and "farrow-finish" (NPPC, 1998) averaged according to the market share of each (USDA/APHIS, 1995b). The average number of 255 eggs per egg-laying chicken in 1997 is assumed (USDA/NASS, 1998b, 1998f). An average broiler weight of 5.5 pounds per bird is assumed, derived from the total number of animals and pounds of production, reported in 1997 (USDA/NASS, 1999d). For turkeys, EPA assumes an average weight of 23.8 pounds per bird derived from weight estimates and market share information for turkey toms and hens (USEPA, 1999j; USDA/NASS, 1999d). No translation is needed for projections for the beef cattle sector because NCBA reports projected returns per occupancy, which EPA converts to per-marketed head using a ratio of occupancy to marketed head calculated using NCBA's data.

Once the available projections are expressed on a per-animal basis, future earnings are approximated by applying the incremental national average change (dollars per animal) between each year during the forecast period to the baseline financial data for each representative model CAFO. This is the same approach used for the Proposal EA. The revised cash streams over the forecast period for EPA's final analysis are shown in Tables 2-6 (farm level) and 2-7 (enterprise level).

Using these per-animal values, EPA calculates the net present value of future earnings for each model CAFO (also shown in Tables 2-6 and 2-7). This approach assumes a 7 percent discount rate over the 10-year period of the analysis (1997 to 2006). The equation EPA uses to calculate the net present value of cash flow is

$$NPV = v_1 + \sum_{i=2}^n \frac{v_i}{(1+r)^{i-1}}$$

where:

- $v_1 \dots v_n$ = series of cash flows
- r = interest rate
- n = number of cash flow periods
- i = current iteration

EPA's adjustment of the DCF analysis to represent post-compliance conditions for each model CAFO is measured based on present value of cash flow less present value of compliance costs.

EPA frequently uses negative post-compliance cash flow calculated over the period of the impact analysis to identify regulated entities that are vulnerable to closure. Several economic analyses for other effluent guidelines have used this measure as the only criterion or as part of a group of criteria for a closure analysis (see USEPA, 1995, 1996, 1997, 1998b, 1999a, 2000c, 2002h, 2002g). In these analyses, EPA has considered negative cash flow over the period of analysis as at least one indicator that a facility might be likely to close post-compliance.

To address public comments on EPA's proposal analysis, the Agency has made a number of changes in the way it evaluates this criterion. The changes EPA has made or considered to its general approach for this assessment criterion to address public comments are as follows. For more information, see EPA's response to comment DCN CAFO 201352-104 and other related comment responses (noted below) in the Comment Response Document in the rulemaking record.

First, EPA has expanded its DCF analysis, which now considers both farm level changes and enterprise level changes in cash flow—the latter which is based on an assessment of the financial effects on an operation's livestock or poultry enterprise. This change addresses comments expressed by many commenters, including FAPRI, other land grant university researchers, and industry, as well as USDA, to principally consider enterprise level effects for EPA's regulatory analysis. The analysis supporting the 2001 Proposal considers farm level effects only. This issue was discussed in the 2001 Notice (66 FR 58580-58582). It is also documented in the rulemaking record (see, for example, USEPA, 2001d; FAPRI, 2001a, 2001b; NPPC, 2001, NCBA, 2001, NMPF, 2001). Many of these comments were supported by alternative enterprise level data that were submitted to EPA since proposal and were presented in the 2001 Notice (USDA/ERA, 2002a and 2002c; FAPRI, 2001a; NCBA, 2001). An enterprise level analysis recognizes that a farm might be unwilling to cross-subsidize a continually failing livestock operation. Also, this approach recognizes that a failing enterprise with continuous cash flow problems would have limited access to financing for capital replacement and/or expansion, despite the health of the overall business. This analysis is conducted using the enterprise level financial data presented in Table 2-3 of this report. Section 2.4.2 provides more information and describes how EPA evaluates enterprise level changes in profitability. More information is in EPA's response to comment DCN CAFO 202402-35.

Second, EPA is using alternative time series data to project available financial data onto a 10-year time horizon for the discounted cash flow analysis. For the proposed rule, EPA used data projections developed by USDA (USDA/WAOB, various years). The 2001 Notice discussed comments that disagree with EPA's use of USDA's data series as the basis for projecting 1997 data, criticizing USDA projections on various grounds. Some comments suggested that EPA replace use of USDA's projections with alternative projections from FAPRI. In making the decision to use alternative projections for some sectors, EPA did not determine that USDA's projections were, in fact, inferior to projections compiled by other sources. EPA has reviewed the alternate projections recommended by commenters, comparing these to other published information. The data that EPA uses for the final analysis are based on a determination that these alternative data provide a better source from which to project out baseline financial conditions over the time period for some sectors. Based on this review, EPA is using alternative timeline data from FAPRI (hog and poultry sectors) and NCBA (cattle sector) to project future earnings from the baseline data. EPA justifies its decision to use alternative FAPRI projections given that FAPRI's publication of its annual projections are well-established and span

decades of ongoing research work; also, FAPRI's work is well-recognized within the agricultural research community and among land grant university researchers.¹⁴ EPA was unable to use FAPRI projections for the cattle sector since these data do not cover the 1997 to 2006 time period of EPA's analysis. Other FAPRI and USDA projections report net returns to cow-calf operations only (and do not correspond to regulated cattle feeding operations). Therefore, EPA uses NCBA's projections for the cattle sector. Both FAPRI's and NCBA's projections compare well with USDA projections. For the dairy sector, EPA continues to use USDA's projections because alternative projections either do not regularly report net returns per milk cow or do not cover the 1997 to 2006 time period of EPA's analysis. Section 2.3 provides more detailed information on these data and EPA's selection process; see also EPA's response to comment DCN CAFO 201352-101. Projections that EPA uses for this analysis are shown in Table 2-4 and are expressed on a per-unit basis (i.e., cash returns per animal or per-unit output). The method EPA uses to project the baseline data follows the approach used for the proposal analysis, as discussed in the Proposal EA.

Third, the 2001 Notice discusses comments received by EPA that oppose the use of post-tax costs to assess financial impacts on the grounds that it is not appropriate to factor tax savings into the cost of compliance for producers. Commenters recommend that EPA not include expected tax offset in its financial tests because operations whose survival is in question would have no positive income against which to offset these "tax benefits." Instead, such operations would be forced to bear the full "pre-tax" costs of implementation. As discussed in the Notice, previous regulatory impact analyses conducted by EPA have evaluated compliance cost impacts on a post-tax basis using a standard cash flow model, incorporating an annualization approach that accounts for tax savings as well as depreciation at a business. This has been done because these costs are more reflective of the costs that are actually incurred by that business. Given this longstanding practice, which follows standard business and accounting practices, EPA continues to account for tax savings in its discounted cash flow analysis. As discussed in Section 2.4.1.1, however, EPA is using pre-tax costs instead of post-tax costs in the sales test for its final analysis. For more information, see EPA's comment-response document on this topic. More information is in EPA's response to comment DCN CAFO 201438-182.

Fourth, although other measures of farm earnings are discussed in the 2001 Notice, EPA decided not to use these other earnings measures, including EBITDA. This alternative measure of earnings would have been used to calculate return on assets and internal rate of return. However, EPA's analysis results using net cash income after taxes and a measure based on EBITDA for earnings are not substantially different for most sectors. Because EPA uses the present value of the total cost of the rule (the present value of operating expenses and capital), the Agency is able to determine whether cash flow is sufficient to cover the cash expenses of the regulations. This approach also provides for capital replacement at the end of the analysis period (or alternatively to cover the principal and interest payments over the period of the analysis). Although a "pass" result indicates that cash flow is positive over the 10-year period of the analysis, it also indicates that there is a cash flow cushion equal to the net present value of the capital expenditure (including the real cost of that capital) over that time frame. As discussed in the 2001 Notice, other possible financial indicators, such as return on assets or equity, were ultimately not used because those measures would involve 1 year of data or a single calculated average over a few years of data. EPA's use of discounted cash flow over the 10-year period of the analysis provides a better indication of whether an enterprise would be likely to remain viable. Indicators such as

¹⁴ Evidence of the community's regard for FAPRI's research contribution is provided in the rulemaking record (see AAEA, 2002). See also EPA's response to comments on FAPRI's data at DCN CAFO 201352-136-4.

return on assets are not ideal indicators of the financial health of an operation's enterprise because assets are rarely assessed at that level. More information is provided in EPA's record (see: ERG, 2001b) and in EPA's response to comment DCN CAFO 201352-104-182.

Some commenters (see, for example, NMPF, 2001) further recommended that EPA incorporate uncertainty into the analysis, pointing to FAPRI's parallel analyses of the 2001 Proposal (FAPRI, 2001a, 2001b). EPA did investigate the possibility of adopting a similar approach for its analysis that would incorporate a probabilistic approach (i.e., one that places probability distributions about available average data, similar to that adopted by FAPRI for its parallel analysis) and discontinue use of a deterministic approach (i.e., one that uses point estimates without any probability distributions, as EPA did for the proposed rule analysis). Information about FAPRI's baseline model is available in the rulemaking record at DCN 175038. EPA is not able to use a probabilistic approach because of data limitations and the challenges inherent to such an approach. For the 2001 Proposal, the financial data used were USDA's 1997 ARMS data, which are reported as average estimates from a statistical survey. Variance analysis of these data are limited. Strict confidentiality requirements on the outside use of USDA's databases also limited EPA's direct access to these and other USDA databases. Therefore, EPA uses average single point estimates for input into its models, as opposed to a broader range of data that would depict financial conditions at operations that are not necessarily represented by the average, such as operations at either end of the distribution (e.g., higher cost, less efficient operations at one end and lower cost, more efficient operations at the other end). Following the 2001 Proposal, EPA did evaluate the possibility of constructing probability distributions about the available financial data using uncertainty analysis techniques. Based on this investigation, EPA does not believe a probabilistic model would have best served the needs of its analysis for the CAFO rule. EPA's efforts demonstrate that such an approach may yield results that are overly dependent on a large number of critical assumptions that may be difficult or impossible to obtain. In general, EPA has concerns about probabilistic models based on its experience in trying to develop a such a model for another regulation of a farming sector (aquaculture or fish farming sectors). For that rulemaking, EPA decided not to pursue this approach, given the complexity and additional information needs to support such an approach. More information is available in the rulemaking record (ERG, 2001e—DCN 375013). See also EPA's response to comment DCN CAFO 201352-136-4.

Many commenters also criticize EPA for not considering impacts in a way that takes into account all of the cash outlays for an operation, including principal payments on loans to purchase the required technology. For reasons outlined in the 2001 Notice, EPA does not include a debt feasibility test as part of its analysis of the final rule because a down payment assumption is not necessary given the Agency's joint analysis of debt-asset ratios and cash flow (see 66 FR 58583-58584). More information is provided in the record (ERG, 2001c; USEPA, 2001c). See also response to comment DCN CAFO201352-104.

2.4.1.3 Debt Test Using Debt-Asset Ratios

The *debt-asset ratio* is a measure of a company's solvency and its ability to finance regulatory costs through additional debt. USDA calculates this measure as the ratio of business debt to business assets and considers it to reflect the share of assets owed to lenders (USDA/ERS, 1997a, 1997e).

To model the regulatory baseline for the representative model CAFOs, EPA uses available debt and asset data to compare changes in the ratio of baseline debt to assets under a postregulatory scenario. EPA calculates the postregulatory debt-asset ratio using the underlying data as follows:

$$\text{Postcompliance Debt-to-Asset Ratio} = \frac{\text{debt} + \text{capital compliance cost}}{\text{asset} + \text{capital compliance cost}}$$

For the 2001 Proposal, EPA used 1997 USDA-reported total farm assets and liabilities (USDA/ERS, 1999a) to evaluate changes in the debt-asset ratio for representative facilities. Changes in these ratios were evaluated based on USDA considerations that an operation facing potential financial stress were with debt-asset ratios exceeding 40 percent (USDA/ERS, 1997a, 1997e). More information is provided in Section 2.4.2.3; see also the discussion in Section 4 of the Proposal EA.

Comments received during the public comment period indicated general approval of EPA's use of debt-asset ratios in the economic analysis. However, many comments expressed concern about the baseline data assumptions and concern about the threshold value assumed to assess regulatory impacts. These comments noted that USDA's debt and asset data that EPA used for the proposal do not represent the current state of borrowing in many of these sectors, particularly among larger operation subject to EPA's regulations that tend to carry more debt than that reflected by USDA's data.

To address comments about the baseline data, EPA uses alternative debt and asset data for the livestock sectors (cattle, dairy, and hog). These data were submitted by FAPRI and NCBA. These alternative debt and asset data were presented in Section 2.3 and are available in the record (see: DCN 175044 and DCN 175038). These alternative data translate to the baseline debt-asset ratios shown in Table 2-2. These data indicate that confinement operations tend to have baseline debt-asset levels ranging from 60 percent to more than 70 percent in the beef, dairy and hog sectors, thus exceeding the USDA-recommended 40 percent threshold for indicating financial stress. The use of these alternative data for the livestock sectors has implications for the debt-asset benchmark for indicating financial stress as part of EPA's analysis. This issue is described in more detail in Section 2.4.2.3.

Because of data limitations, EPA continues to use USDA-reported average debt and asset data for the poultry sectors used for proposal. EPA also continues to evaluate these data using USDA recommendations that a 40 percent threshold indicates financial stress.

For more information, see EPA's response to comment DCN CAFO 210352-106 and also DCN CAFO 201438-207-1.

2.4.2 Criteria for Assessing Financial Effects

EPA uses its financial models, incorporating the data presented in Section 2.3 and the assessment criteria described in Section 2.4.1, to assess financial effects on select representative model CAFOs. The analysis for the final rule retains the general modeling framework that EPA used to assess economic effects for the 2001 Proposal (see 66 FR 3079-3103), with the modifications discussed in both the 2001 Notice and the 2002 Notice. Both Notices describe a range of methodological changes and financial data EPA considered for its analysis.

For the 2001 Proposal, the three assessment criteria described in Section 2.4.1 (sales test, discounted cash flow, and debt-asset ratios) were evaluated using USDA data reflecting financial conditions at the whole-farm level (reflecting income and cost information spanning an operation's

primary livestock production, as well as secondary livestock and crop production, government payments, and other farm-related income). For the final regulations, EPA conducts its discounted cash flow analysis using both farm level and enterprise level financial data. EPA still evaluates changes in the debt-asset levels using farm level data. EPA's sales test is also based on an evaluation of farm level revenue data, but it is primarily used as an initial screen of potential impacts that indicates the need for further evaluation.

2.4.2.1 Decision Matrix for "Economic Achievability"

For the 2001 Proposal, EPA's basis for determining economic achievability for the proposal was measured in terms of potential facility level (farm) closures and not potential product line (enterprise) closures. For the final regulations, economic achievability is determined based on an analysis measured both in terms of potential farm closures and potential enterprise closures.

The farm level analysis that supports the final rulemaking retains the same general framework used for the 2001 Proposal. Specifically, financial impacts are assessed using a sales test, discounted cash flow analysis, and debt-asset test. This evaluation is conducted using the farm level financial data presented in Table 2-2. These farm level data reflect income and cost information spanning an operation's primary livestock production, as well as secondary livestock and crop production, government payments, and other farm-related income.

As was done for the proposed rule, EPA divides the impacts of the final regulations into three financial impact categories: Affordable, Moderate, and Stress. The first category is the "Affordable" category, which means that the regulations have little or no financial impact on CAFO operations. The second category is the "Moderate" impact category, which means that the regulations would have some financial impact on operations at the affected CAFOs, but EPA does not consider these operations to be vulnerable to closure as a result of compliance. EPA considers that for CAFOs in both the "Affordable" and "Moderate" impact categories the final requirements are economically achievable. Operations experiencing financial stress, however, are considered to be vulnerable to closure because of the costs of this rule.¹⁵ EPA considers the "Stress" impact category to indicate that the final requirements might not be economically achievable by the CAFO, subject to other considerations. Table 2-8 shows a summary of how EPA assesses these criteria using farm level data. Figure 2.1 illustrates the decision matrix graphically. Additional information on this approach is provided in the Proposal EA.

In general, EPA considers the regulations to be economically achievable for a representative model CAFO if the average operation has a post-compliance sales test estimate within an acceptable range, positive post-compliance cash flow over a 10-year period, and a post-compliance debt-asset ratio not exceeding a benchmark value. The benchmark value on the debt-asset test assumed for this analysis varies depending on the baseline conditions reported in the financial data used to conduct the analysis (discussed in Section 2.4.2.3) based on new data and recommendations submitted to EPA during the public comment period.

¹⁵ Commonly used measures of "farm financial stress" include bankruptcies, foreclosures, and net exits (Stam et al., 1991). Indicators of stress in agriculture as reported by farm banks include delinquent loans, discontinued financing, farm closures, liquidation, and bankruptcy (Stam et al., 1991, 2000).

EPA conducted its analysis first at the farm level based on data reflecting financial conditions for the entire farm operation (e.g., reflecting income and cost information spanning the entire operation, thus considering the operation's primary livestock production, along with other income sources such as secondary livestock and crop production, government payments, and other farm-related income). Based on the farm level results, EPA also assessed the financial effects on CAFOs at the enterprise level (e.g., limiting the scope of the assessment to the operation's livestock or poultry enterprise, and excluding other non CAFO-related sources of income from the analysis).

Starting with the farm level analysis, EPA considers the regulations to be economically achievable for a representative model CAFO if the average operation has a post-compliance sales test estimate within an acceptable range, a positive post-compliance cash flow over a 10-year period, and a post-compliance debt-to-asset ratio not exceeding a benchmark value. Specifically, if the sales test shows that compliance costs are less than 3 percent of sales, or if post-compliance cash flow is positive and the post-compliance debt-to-asset ratio does not exceed a benchmark (depending on the baseline data) and compliance costs are less than 5 percent of sales, EPA considers the options to be "Affordable" for the representative CAFO group. (Although a sales test result of less than 3 percent does indicate "Affordable" in the farm level analysis, further analysis is conducted to determine the effects at the operation's livestock or poultry enterprise.) The benchmark values assumed for the debt-asset test are sector-specific. EPA assumes a 70 percent benchmark value for the debt-asset test to indicate financial stress in the hog and dairy sectors, and an 80 percent benchmark for the debt-asset test to indicate financial stress in the beef cattle sector. These benchmark values address public comment received and alternative debt and asset data submitted for the livestock sectors. For the poultry sectors, however, EPA did not obtain alternative debt and asset data and continues to evaluate data used for proposal against a 40 percent benchmark value.

A sales test of greater than 5 percent but less than 10 percent of sales with positive cash flow and a debt-to-asset ratio of less than these sector-specific debt-asset benchmark values is considered indicative of some impact at the CAFO level, but at a level not as severe as those indicative of financial distress or vulnerability to closure. These impacts are labeled "Moderate" for the representative CAFO group. EPA considers both the "Affordable" and "Moderate" impact categories to be economically achievable by the CAFO, subject to the enterprise analysis (see below). If, with a sales test of greater than 3 percent, post-compliance cash flow is negative or the post-compliance debt-to-asset ratio exceeds these sector-specific debt-asset benchmarks, or if the sales test shows costs equal to or exceeding 10 percent of sales, EPA considers the final regulations to be associated with potential financial stress for the entire representative CAFO group. In such cases, each of the operations represented by that group might be vulnerable to closure. For operations that are determined to experience financial "Stress" at the farm level, the final requirements are likely not economically achievable.

The enterprise level analysis builds on the farm level analysis, evaluating effects at a farm's livestock or poultry enterprise. If the farm level analysis shows that the regulations impose "Affordable" or "Moderate" effects on the operation, the enterprise level analysis is conducted to determine whether the enterprise's cash flow is able to cover the cost of regulations. This analysis uses a discounted cash flow approach similar to that used to assess the farm level effects, in which the net present value of cash flow is compared to the net present value of the total cost of the regulatory options over the 10-year time frame of the analysis. Over the analysis period, if an operation's livestock or poultry enterprise maintains a cash flow stream that both exceeds the cash costs of the rule (operating and maintenance costs plus interest) and covers the net present value of the principal payments on the capital, EPA concludes that the enterprise will likely not close because of the CAFO rule. This analysis is conducted

on a pass/fail basis. If the net present value of cash flow minus the net present value of the rule's costs is greater than zero, the enterprise passes the test and the enterprise is assumed to continue to operate. EPA considers these results to indicate that the final requirements are economically achievable. If the net present value of cash flow is not sufficient to cover the net present value of the cost of the rule, EPA assumes that the CAFO operator would consider shutting down the livestock or poultry enterprise. That is, if an operation fails the enterprise level analysis, these operations are determined to experience financial "Stress" and the final requirements are likely not economically achievable.

The enterprise level analysis builds on the farm level analysis, evaluating effects at a farm's livestock or poultry enterprise. If the farm level analysis shows that the regulations impose "Affordable" or "Moderate" effects on the operation, the enterprise level analysis is conducted to determine whether the enterprise's cash flow is able to cover the cost of regulations. This analysis uses a discounted cash flow approach similar to that used to assess the farm level effects, where the net present value of cash flow is compared to the net present value of the total cost of the regulatory options over the 10-year time frame of the analysis. Over the analysis period, if an operation's livestock or poultry enterprise maintains a cash flow stream that both exceeds the cash costs of the rule (operation and maintenance costs plus interest) and covers the net present value of the principal payments on the capital, EPA concludes that the enterprise would likely not close because of the CAFO rule. This analysis is conducted on a pass/fail basis. If the net present value of cash flow minus the net present value of estimated compliance costs is greater than zero, the enterprise passes the test and is assumed to continue to operate. EPA considers these results to indicate that the final requirements are economically achievable. If the net present value of cash flow is not sufficient to cover the net present value of estimated compliance costs, EPA assumes that the CAFO operator would consider shutting down the livestock or poultry enterprise. In such cases, EPA conducts further analysis before making a final assessment of whether the final requirements are economically achievable.

Table 2-8 shows a summary of how EPA assesses these criteria using enterprise level data, providing additional analysis of the farm level assessment. Figure 2.1 illustrates the decision matrix graphically. The following section provides more information on the enterprise level analysis and how it builds on the farm level analysis.

In response to comments, EPA has conducted additional supplemental analysis to determine the effects of the regulation under two different scenarios. One scenario takes into consideration the effects of long-run market adjustment following implementation of the final regulations. This analysis is conducted using simulated changes in producer revenue given changes in market prices as depicted by EPA's market model, which uses estimates of price and quantity response in these markets. A second scenario takes into consideration potential cost share assistance under Federal and State conservation programs, assuming that a portion of costs are covered by cost sharing subject to programmatic constraints. Given the uncertainty of whether CAFO income will rise in response to long-run market adjustment or whether available cost share dollars will effectively offset compliance costs at regulated CAFOs, EPA's analysis to determine whether the regulation is "economically achievable" does not rely on such assumptions as part of its regulatory analysis and therefore reflects the highest level of impacts projected. EPA presents the results of this analysis assuming both some degree of cost passthrough and no cost passthrough, as well as some degree of cost share assistance and no cost share assistance, along with the results of its lead analysis. More information on these supplemental analyses is provided in Section 2.4.3 of this report. The results of this analysis are provided in Section 3.3.

Table 2-8. Economic Achievability Criteria for the Final CAFO Regulations

Criteria	Affordable	Moderate	Stress
Farm Level Analysis			
Sales test < 3%	X		
Sales test > 3% AND negative farm cash flow OR debt-asset \geq benchmark value ^{/1}			X
Sales test < 5% AND positive farm cash flow AND debt-asset < benchmark value ^{/1}	X		
Sales test \geq 5% but < 10% AND positive cash flow AND debt-asset < benchmark value ^{/1}		X	
Sales test \geq 10%			X
Enterprise Level Analysis			
“Affordable” farm level effects with negative enterprise cash flow			X
“Affordable” farm level effects with positive enterprise cash flow	X		
“Moderate” farm level effects with negative enterprise cash flow			X
“Moderate” farm level effects with positive enterprise cash flow		X	
Economically Achievable	X	X	

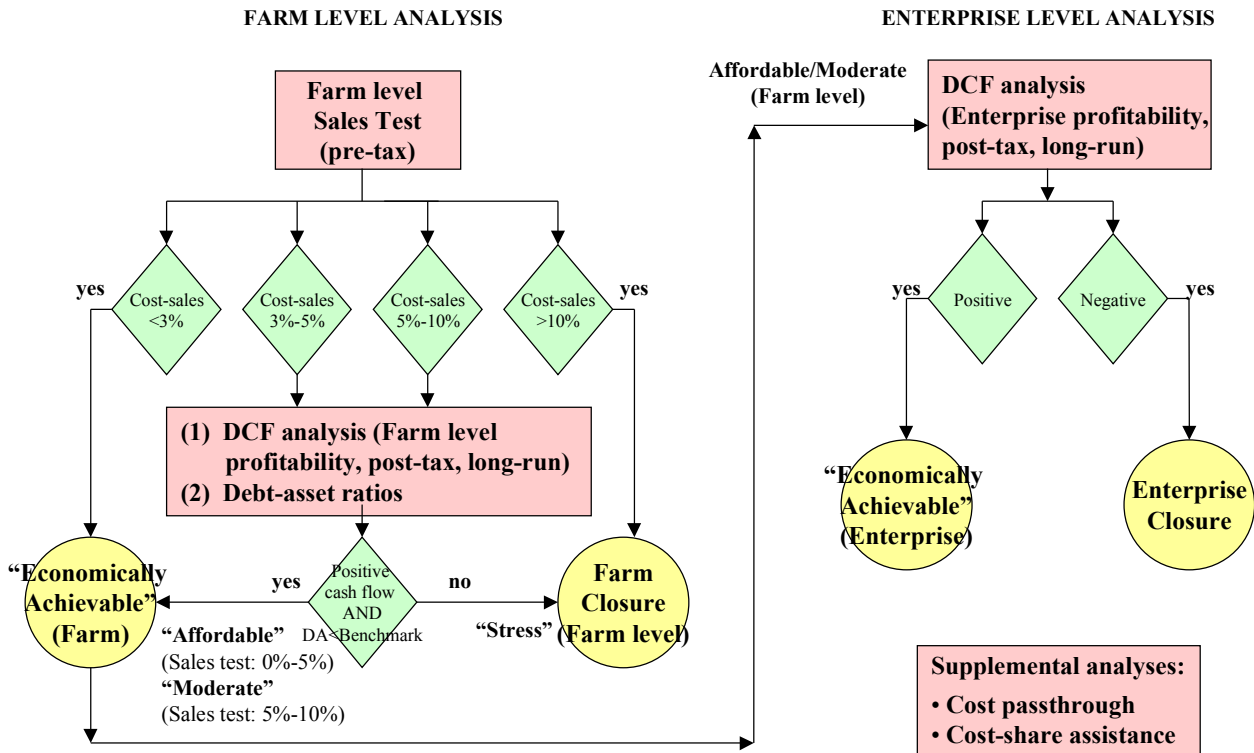


Figure 2-1. Schematic of EPA's Decision Matrix of "Economic Achievability"

2.4.2.2 Analysis of Effects at Multiple Business Levels

For the 2001 Proposal, EPA evaluated financial impacts using USDA data aggregated at the whole-farm level because data obtained from USDA did not allow for an enterprise level analysis. Therefore, EPA's basis for determining economic achievability for the proposal was measured in terms of potential farm closures and not potential enterprise closures.¹⁶ Both of EPA's Notices present additional data received since proposal that EPA uses to assess financial impacts at multiple business levels within a representative facility (presented in Section 2.3 of this report). Using these data, EPA evaluates financial impacts both at the farm level and the enterprise level for the final regulations.

¹⁶ EPA typically conducts its analyses of regulated entities using data for a business as a whole as opposed to an individual product line because of data limitations. The only recent ELG regulation to evaluate product line closures is that for the Pesticide Formulating, Packaging and Repackaging industry, for which enterprise level financial data were collected through a CWA Section 308 survey (USEPA, 1996, or 61 FR 57518).

Perhaps the principal concern raised by researchers at various land grant universities and USDA is that EPA should evaluate financial impacts on regulated CAFOs using an enterprise level analysis only. As discussed in the 2001 Notice, many commenters claim that EPA's use of farm level financial data raises questions as to whether a CAFO would willingly subsidize one of an operation's enterprise with dollars from another enterprise at the business. These commenters question whether producers at more diversified operations would choose to cross-subsidize an unprofitable enterprise for long periods or whether they would instead shift assets toward other, more profitable enterprises at their operation; these producers might not quit farming but would remove the nonproductive enterprise from their farming mix (FAPRI, 2001a, 2001b; NPPC, 2001). This criticism was also raised before and after the 2001 Proposal (USEPA, 2001d). Other commenters point out that larger operations are normally enterprise-specific and tend to specialize. Therefore, an enterprise approach might be more appropriate for EPA's analysis. Other commenters also note that the use of enterprise level data in the form of "enterprise budgets" is more consistent with a representative farm approach, which was the general approach EPA adopted for evaluating financial impacts for the 2001 Proposal (NMPPF, 2001). FAPRI (2001a) has also noted that although an evaluation of impacts at the farm level has merit, it is also prone to confounded results because enterprise-specific costs are spread over a larger share of the business (e.g., non-livestock enterprises bear the cost of regulations affecting the livestock portion of the operation). Some commenters, however, disagree with an approach that would consider an assessment at the enterprise level only (see, for example, Weida, 2002; Ikerd, 2002).

For the 2002 Proposal, EPA acknowledged many of the concerns expressed in public comments about the need to consider enterprise level financial effects. In the industry profile and data sections of the Proposal EA (see Section 2 and Section 4, respectively), EPA readily acknowledged limitations of these data stating that data were not available to evaluate an operation's livestock or poultry enterprise separate from the whole business operation. EPA also agrees with comments stating use of farm-level financial data raises questions of whether a CAFO would willingly subsidize one enterprise with dollars from other farm enterprises (e.g., whether producers at more diversified operations would choose to cross-subsidize an unprofitable enterprise for long periods or whether they would instead shift assets towards other, more profitable enterprises at their operation). Such producers might not quit farming but would only remove the non-productive enterprise from their farming mix. EPA recognizes that larger operations are normally enterprise specific and tend to specialize, focusing on a single enterprise; therefore, an enterprise approach may be more appropriate for EPA's analysis. EPA also recognizes that the use of enterprise level data in the form of "enterprise budgets" is more consistent with a representative farm approach, which was the general approach adopted by EPA for evaluating financial impacts for the 2001 Proposal. These concerns were noted by EPA in the 2001 Notice (66 FR 58580-58582). Because alternative enterprise level financial data were submitted to or obtained by EPA during the comment period, EPA has responded to these comments by including an analysis of the enterprise level effects as part of its overall assessment. Both of the Notices of Data Availability that EPA has published on this rule presented alternative enterprise level financial data and discussed options for evaluating enterprise level effects as part of the analysis, soliciting further review and comment on this issue. See: "2001 Notice" (November 21, 2001, 66 FR 58556) and the "2002 Notice" (July 23, 2002, 67 FR 48099), as well as DCN 375084 in the rulemaking record.

Although EPA agrees with comments that an evaluation of impacts at the farm level might be susceptible to confounded results because enterprise-specific costs are spread over a larger share of the business (including non-livestock enterprises), the Agency notes the merit in including an analysis of the farm level effects as well, since an analysis focused at the enterprise level only would ignore the interdependency among related enterprises at an operation. Comments by Ikerd (2002) noted that an enterprise level analysis would:

“ignore the fact that, on many diversified farming operations, the output of one enterprise becomes the input of another and the waste of one enterprise becomes a resource for another.” Enterprise analysis treats separate enterprises as if they were ‘independent,’ whereas, on diversified farms enterprises are instead “interdependent.” In addition, on well-managed, diversified farms, the different enterprises are complements, not substitutes—i.e. the enterprises ‘cross-subsidize’ each other by nature. Enterprise analysis quite simply is not appropriate to address issues where diversification is a logical management strategy—as is most clearly the case in dealing with environmental issues.”

EPA recognizes the importance of considering financial impacts at multiple levels within a business because this is consistent with economic theory and is a technically sound approach. This approach is also consistent with how businesses make decisions because most businesses would be unwilling to cross-subsidize a failing enterprise over a long period rather than simply discontinuing it. Also, a failing enterprise might have limited access to available financing for capital replacement or expansion of the operation because lenders typically look at expected cash flow for an operation’s enterprise in making loan decisions (ERG, 2001c). Focusing on the enterprise level further addresses changes in an operation’s ability to diversify and manage risk, and it might also affect industry concentration and consolidation trends. Therefore, for the final rule analysis, although EPA’s primary level for evaluating financial effects remains the farm level, the Agency has supplemented this approach with an assessment of the potential enterprise level effects of the regulation. EPA’s final analysis approach using both farm level and enterprise level financial data for this effort.

EPA believes that both levels of analysis have merit in evaluating the financial effects of regulation in an industry. EPA has used this multi-level approach in other economic analyses it has performed for effluent guidelines. In the manufacturing sectors the key components of an impact analysis are the firm and the facility. EPA looks at whether a facility can absorb the costs of compliance while still remaining viable (typically, if cash flow is negative post-compliance, the facility is considered nonviable). The facility may be able to absorb the cost of compliance, but the firm may not be able to obtain the necessary capital to meet requirements or may fail as a result of incurring the costs of compliance at multiple facilities. Thus a firm level analysis is also performed. Impacts on both firms and facilities are considered in EPA’s assessment of economic achievability. This approach supports observations noted in some comments on the CAFO rule, pointing out that farmers may support an enterprise because the output of one enterprise is used as input to another apply to analyses of firms and facilities. These facilities may be considered “captive” facilities, in that they are not stand-alone or the output of one is the input to another facility. Only an analysis at the firm level would reveal whether the firm can afford to keep going even if one or more facilities does not appear viable. Thus, EPA believes that an analysis covering both the farm level and the enterprise level is appropriate for this rulemaking.

For these reasons EPA is expanding its analysis to include an assessment of enterprise level effects. Other comments, however, challenge EPA’s assessment of financial effects at the regulated entity, claiming that this assessment should be made for the “industry as a whole” and that economic factors be given only minimal consideration in setting effluent guidelines (Water Keepers Alliance, et al., 2001). Related comments presented by various groups during the development of the rulemaking further support conducting this analysis based on financial effects measured at the processor and consumer level (see, for example, USEPA, 2001f, and notes from other EPA meetings during the development of the rulemaking). As noted in the 2001 Notice, EPA has not modified its economic models to consider financial data for processing firms (66 FR 58581), as described below.

EPA continues to consider farm level impacts in addition to other assessed effects at the enterprise level because of concerns about evaluating impacts at the enterprise level only, as discussed in the 2001 Notice (see discussion starting at 66 FR 58580). As a practical matter, EPA recognizes that often the individual enterprises at an operation are highly interdependent, such as in the case of integrated production systems where there may be considerable cost savings due to shared production and labor costs among multiple enterprises. This is also true where one enterprise (e.g., grain crop production) serves as an input to another (e.g., livestock production). An analysis using enterprise level data might also fail to account for the range of assistance to the farming operation available through various government programs, which are often noted as a separate source of farm level income in USDA's data compendiums. Also, as pointed out by one lender questioned by EPA, lenders usually look at the debt-carrying capacity of the farm operation as a whole, except in the unusual instance when the lien is on only the enterprise (ERG, 2001c). Finally, farms are commonly noted to be motivated by noneconomic factors, which might influence an operation's decision to weather the boom and bust cycles that are commonplace in agricultural markets (USEPA, 2001, Heimlich and Barnard, 1995).

For additional information, EPA's response to comment DCN CAFO202402-35 in the Comment Response Document in the rulemaking record.

The issues described above raise questions about whether a decision to conduct EPA's analysis strictly at the enterprise level has merit. Also, previously published academic research by both the land grant universities and USDA has typically evaluated impacts using data and methods specified at the farm level or has, at least, taken into consideration information for the larger business concern (DPRA, 2001). This is all consistent with EPA's long-standing practice and consistent with Agency guidance to assess impacts on small businesses at the broader business level (USEPA, 1999i; SBA, 1998; USGPO, 2000).

Since the publication of the 2001 Notice, EPA has evaluated ways to incorporate an enterprise level analysis as part of its assessment. How EPA incorporates its enterprise level analysis into its overall decision-making framework was described in Section 2.4.2.1.

EPA conducts its enterprise level profitability test on a cash basis, which excludes both the noncash income and noncash expenses (depreciation). In agricultural accounting, net cash income measures the difference between gross cash income and cash expenses, including net rent to non-operator landlords. It does not include depreciation. This approach is consistent with Farm Financial Standards Council (FFSC) guidance. FFSC makes several recommendations concerning the role of unpaid labor and management in the income statement: "For analysis purposes, the FFSC recommends the following: (a) the general income statement should include a calculation of gross revenues and farm income, both on an accrual adjusted basis; (b) a charge for unpaid family labor and management should not [emphasis, as underlined, in the original] be included on the income statement;..." (FFSC, 1997, p. II-3). Other FFSC recommendations that support EPA's approach include the following: "For the purpose of analysis, the FFSC recommends the following on the issue of NFI (net farm income): NFI will continue to be defined as the return to operator and unpaid family labor, management and equity capital. No estimate of a charge for unpaid labor and management should be included on the income statement" (FFSC, 1997, p. II-22). Based on this guidance, EPA decided not to use net farm income as the profitability measure for this analysis. Net farm income is the difference between gross farm income and total production expenses, whereas gross farm income includes noncash income such as the value of home consumption and the rental value of dwellings. Also, in many cases the farm operation is also the owner-operators'

home; operator returns are calculated by excluding the income and expenses associated with farm operators' dwellings from net farm income.

2.4.2.3 Basis for Benchmark Values for Assessment Criteria

For the 2001 Proposal, the principal basis for EPA's economic achievability criteria for this rulemaking is USDA's financial classification of U.S. farms. In its analyses of the financial performance of U.S. commercial farms, USDA uses a combination of a farm's net income and debt-asset ratio to classify the overall financial position of a farm based on annual earnings and solvency (USDA/ERS, 1997e). Net farm income is an effective measure of long-term profitability; the debt-asset ratio is a useful measure of a farm's financial risk. Together these two measures provide an indicator of the farm's long-term financial health and viability (Sommer et al., 1998). For example, if a farm earns enough income to service debt and meet its other financial obligations, a high debt-asset ratio might be acceptable, while a farm carrying a low debt load might be able to weather periods of low or negative farm income (Sommer et al., 1998). USDA considers net income and debt-asset ratio jointly to classify farm performance by financial position, ranging from "favorable" to "unfavorable" (Sommer et al., 1998; USDA/ERS, 1997a, 1997e). USDA's classification scheme broadly identifies an operation with negative income and a debt-asset ratio in excess of 40 percent as "vulnerable." An operation with positive income and a debt-asset ratio of less than 40 percent is considered "favorable."

EPA adopts this scheme as part of its economic achievability criteria, using net cash flow to represent income and assuming a debt-asset threshold value of 40 percent. More information is presented in Section 4 of the Proposal EA.

As presented in the 2001 Proposal, USDA's debt-asset ratio threshold of 40 percent, which defines whether a farm is highly leveraged, is consistent with other recommendations (Ohio State University, 1999). Although a higher ratio usually indicates financial risk, debt-asset ratios tend to be higher for large farms and for those specializing in livestock feeding (Iowa State University, 1999b). For example, ratios of 30 to 40 percent are common among Iowa farms, although many operate with little or no debt (Iowa State University, 1999b). Another caution when considering debt-asset ratios is that a high debt load does not make farms less efficient; high-efficiency farms are able to service a higher debt load and maintain a higher debt-asset ratio with less risk than low-efficiency farms (Iowa State University, 1999b). As noted in the Proposal EA, the range of acceptable values for an operation's debt-asset ratio will vary depending on income variability, the proportion of owned land (or other assets) used in the farming operation, risks associated with normal production, and fluctuations in farm asset values that might occur due to changes in demand for agricultural assets (FFSC, 1997). For more information, see Section 4 of the Proposal EA.

EPA received several comments on the debt-asset test. Criticism of EPA's debt-asset test fall into two interrelated groupings, one criticizing the baseline data assumptions and the other criticizing the threshold value chosen to assess regulatory impacts. These comments noted that USDA's debt and asset data that EPA used for the proposal do not represent the current state of borrowing in many of these sectors, particularly for the size of operation subject to EPA's regulations which tend to carry more debt than that reflected by USDA's data. Comments challenging the baseline debt and asset data used for the 2001 proposal further raise questions the appropriateness of using USDA's recommended 40 percent benchmark value for assessing these larger-sized confinement operations. The 2001 Notice (November 21, 2001, 66 FR 58556) presented some of these concerns and described alternative data and approaches

that EPA was considering (see 66 FR 58585-58589). The 2002 Notice of Data Availability (July 23, 2002, 67 FR 48099) discussed additional considerations, providing further details and discussions of data pertaining to EPA's analysis for the final rule, thus soliciting further comment on this issue (see 67 FR 48105). Other information supporting the 2002 Notice was provided in DCN 375084 in the rulemaking record. For additional information, see EPA's comment-response document on this topic.

Commenters generally claimed that USDA's 40 percent threshold value, used by EPA in its baseline model to assess post-regulatory debt-asset ratios, does not reflect the financial reality of today's livestock or poultry industry. They also claimed that this debt level does not represent the current state of borrowing in many of these sectors (see, for example, NPPC, 2001; NMPF, 2001). These comments noted that the USDA 1997 data fail to account for the wide range of variability among farm operations, based on various factors, including facility size and the age of the farm operators. Alternative data submitted along with these comments support these claims.

To address comments about the baseline data, EPA uses alternative debt and asset data for several livestock sectors (cattle, dairy, and hog), which were submitted by FAPRI and NCBA.¹⁷ These data indicate that larger, more intensive, or expanding operations tend to carry more debt than that reflected in data used by EPA for the proposal. This fact is supported by information EPA obtained from major agricultural lenders following the proposal; EPA's own discussions with farm lenders indicate a 60 percent debt level for "typical" operations (ERG, 2001c). See data presented in Table 2.2 in Section 2.3. By contrast, average USDA-reported data tend to cover a broader range of farm types and sizes, including small farms and non-confinement operations that are not subject to the regulations. EPA believes that alternative debt and asset data submitted by commenters and presented in both Notices are more appropriate for this analysis than data used for the proposal analysis. (EPA did not obtain alternative data for the poultry sectors; therefore, the Agency continues to use the same USDA-reported average debt and asset data and USDA's 40 percent threshold to indicate financial stress, as was done for proposal.)

The use of these alternative data, however, has implications for the debt-asset benchmark for indicating financial stress for these sectors. As shown in Table 2.2, these data translate to the baseline debt-asset ratios ranging from 60 percent to more than 70 percent and exceed the USDA-recommended 40 percent benchmark indicating financial stress. Therefore, USDA's recommended 40 percent benchmark is not suitable for assessing changes in debt at operations using these alternative debt and asset data. Use of alternative data submitted during the comment period (indicating that baseline debt-asset levels at some representative facilities exceed 40 percent and often exceed 70 percent) point to the need for EPA to consider an alternative benchmark to evaluate this test .

Since USDA's recommended 40 percent benchmark is not suitable for assessing operations using these alternative data, both of EPA's Notices and related supporting documentation requested information about alternative benchmark assumptions to evaluate changes in the baseline debt and asset data, soliciting further comment on this issue. In general, commenters claim that financial stress would occur at operations facing debt-asset ratios of roughly 60 percent to 80 percent. One commenter suggested that a ratio of more than 60 percent would be indicative of stress and that a ratio of more than 70 percent would result in bankruptcy (NMPF, 2001). The basis for this recommendation is farm credit information from the American Bankers Association's Farm Financial Standards Task Force suggesting

¹⁷ These alternative debt and asset data are available in the record (see: DCN 175044 and DCN 175038)

that debt-asset levels in excess of 60 percent act as “red light” indicators to lenders (USEPA, 2001c; Cryan, 2001). The 2002 Notice solicited comment on an assumption of an 80 percent benchmark value to indicate financial stress for these sectors. This alternative benchmark is based on recommendations by NCBA (NCBA, 2002— DCN 375047). EPA’s own discussions with farm lenders indicate a 60 percent debt level for “typical” operations (ERG, 2001c). Most lenders require an operation to retain a 40 percent equity base in the operation, although lower bases may be acceptable, particularly where the majority of debt is in short-term livestock loans or at very large operations. Therefore, debt-asset ratios of nearly 70 percent (reflecting a 30 percent equity stake) at very large operations represented in the NCBA survey may reflect both of these factors (NCBA, 2001).

In response to the 2002 Notice, EPA received comments recommending alternative benchmarks ranging from 50 percent to 70 percent for all sectors. One commenter representing the hog industry provided information from university researchers recommending a benchmark of 70 percent for larger hog operations and 50 percent for smaller hog operations; information provided suggests that an 80 percent benchmark is too high for a farrow finish operation since neither the animals or the facilities in this sector is as marketable as beef cattle (DCN 600031). EPA disagrees with the use of this lower bound benchmark given that the alternative debt-asset ratios that EPA presented in the 2002 Notice already exceed this level; however, EPA’s “economic achievability” analysis is focused on larger-sized operations with more than 1,000 AU and therefore does not require that EPA establish an appropriate benchmark for smaller-sized operations. Other comments presented information from agricultural lenders supporting a benchmark of 70 percent for all sectors (DCN 600060 and DCN 400158). Because this recommendation originated from university staff and agricultural lenders, EPA generally recognizes that it should consider a lower benchmark for some sectors. Given these considerations and because USDA’s recommended 40 percent benchmark is not suitable for evaluating the alternative debt and asset data that EPA is now using to reflect baseline conditions at regulated CAFOs, EPA is assuming for the final rule analysis a 70 percent benchmark value for the debt-asset test to indicate financial stress in the hog and dairy sectors and an 80 percent benchmark for the debt-asset test to indicate financial stress in the beef cattle sector.

To further evaluate these data and alternative benchmark values, and the implications for EPA’s analysis, the Agency conducted additional sensitivity analyses. This analysis indicates that the use of the alternative 70 percent benchmark does not change the overall results of EPA’s analysis for these sectors, compared to an analysis assuming an 80 percent threshold value for the debt-asset test. This finding holds for each of the cattle, dairy, or hog sectors. For each of the affected livestock sectors, EPA’s sensitivity analysis compares the results of the economic analysis assuming two alternative benchmark values for its debt-asset test: one debt-asset benchmark assesses the results of this test assuming that financial “stress” occurs if the ratio of debt to assets exceeds 80 percent (“main” analysis); another debt-asset benchmark assesses the results of this test assuming that “stress” occurs if the ratio exceeds 70 percent (“alternative” analysis). This test is used in conjunction with EPA’s two other assessment criterion for this analysis sales test and DCF analysis, with no change from the main analysis. The results of these analyses indicate that EPA’s analysis results are stable across a range of input data (ERG, 2002c—DCN 375111). For more information, see EPA’s response to comments DCN CAFO 210352-106 and DCN CAFO 201438-207-1.

The threshold values EPA uses for its sales test (3 percent, 5 percent, and 10 percent) are those the Agency has determined to be appropriate for this rulemaking and are consistent with threshold levels used by EPA to measure impacts of regulations for other point source dischargers. See Section 4 of the Proposal EA. EPA has used 1 percent and 3 percent sales test benchmarks to screen for potential impacts

in many small business analyses (e.g., USEPA, 2000c, 1999a). These benchmarks are only screening tools, but do support EPA's contention that a sales test of less than 3 percent generally indicates minimal impact (Snyder, 2000). Heimlich and Barnard (1995) do not define a threshold where the management measures would be considered economically achievable because "...there are no hard and fast guidelines for what is economically achievable, any appraisal of overall achievability... is subjective."

The 5 percent benchmark is consistent with threshold values established by EPA in previous regulations for other point source dischargers. Generally, EPA's analyses have assumed that sales tests less than 5 percent indicate compliance costs that are achievable (see, for example USEPA 1987 and 1994). Other analyses have assumed the same threshold but have further assumed that ratio values in excess of 5 percent may constitute moderate impacts, taking into consideration other factors (USEPA 2000b, 1999b, and 1996). This analysis adopts this framework to analyze regulatory impacts to CAFOs. In another analysis, a sales test result of greater than 5 percent was labeled a "sales impact" (USEPA, 1987). Sales impacts were assessed separately from those impacts that may make a facility vulnerable to closure.

EPA uses an upper limit for a sales test result of 10 percent (whereby this result alone indicates financial stress), rather than assuming that there is no upper limit on a sales test percentage if other financial variables are also analyzed (such as in USEPA, 1996). EPA believes, in this case, that if a sales impact is very high, this result should be considered a substantial impact and might make an operation vulnerable to closure in spite of positive cash flow and an adequate debt-asset ratio. EPA thus uses the 10 percent benchmark to ensure that potential vulnerability will not be underestimated. In fact, relatively few operations could incur costs greater than 10 percent of revenues while continuing to show positive cash flow.

Because EPA does not use a sales test alone as a measure of financial vulnerability, the sales test operates more as a screening tool. In most cases (results between 3 percent and 10 percent), a finding of financial stress is driven by cash flow and debt burden considerations. Thus, over the key range of sales impacts, EPA's methodology is consistent with many USDA analyses, which very frequently use net income and debt-asset ratios to assess impacts (e.g., USDA/ERS, 1997e). The exception is that EPA does not consider noncash income and depreciation (that is, EPA uses a *net cash income*-type analysis rather than a *net farm income* analysis). This is consistent with current views on the use of cash flow analysis, which is preferred over net income analysis among financial analysts (Brigham and Gapenski, 1997; Jarnagin, 1996).

Finally, as noted in the 2001 Notice, EPA has not modified its economic models to take into consideration financial data for processing firms (66 FR 58581). Such an approach has been suggested because of the affiliation between some CAFOs (e.g., contract growers) and processing firms through various contractual arrangements in some sectors. Data are not available to conduct such an analysis: EPA does not have market information on which processors and CAFOs participate in such contract agreements; financial data for processing firms that contract out the raising of animals to CAFOs are also not available. Consistent with how EPA conducted its analysis for the 2001 Proposal, EPA will continue to assume that an assessment of the regulatory impacts of the final regulations is more accurately conducted for the regulated CAFO that incurs the cost of the final requirements. EPA solicited comments on this approach and requested additional financial data to conduct such an analysis in its 2001 Proposal and Notice. EPA continues, however, to evaluate expected broader market level changes using the assumptions of cost passthrough that were developed for the proposal as a surrogate for more complex market level models that would take into account structural adjustment among farmers as well as market adjustment in the long run.

2.4.2 Supplemental Analyses

This section discusses supplemental analyses performed by EPA to evaluate financial effects on CAFOs. Section 2.4.3.1 describes how EPA evaluates the effects of long-run market adjustments under a post-compliance scenario, assuming that eventual higher prices and facility revenue might partially offset the estimated financial effects on regulated CAFOs. This analysis modifies a similar analysis conducted for the 2001 Proposal in which EPA assumed a portion of the costs are passed up through the food marketing chain under assumptions of long-run market adjustment. Section 2.4.3.2 describes how EPA evaluates the effects of the final regulations in conjunction with increased funding of available cost-share assistance programs, assuming that these program monies might partially offset the estimated compliance costs to regulated CAFOs. Section 2.4.3.3 describes other supplemental analyses considered by EPA.

Although EPA conducts various supplemental analyses of alternative assumptions in its analysis (for example, analyzing the potential CAFO closures assuming both no long-run market adjustment or cost passthrough, or assuming both some degree of cost share assistance and no cost share assistance), the Agency decided not to base its statutory analysis of “economic achievability” on such assumptions. The reason for this decision is continued uncertainty about how to incorporate such assumptions into its analysis. Therefore, EPA’s analysis reflects the highest level of financial effects projected. The basis for EPA’s decision is discussed in the Comment Response Document in the rulemaking record. Response to comment DCN CAFO201717-32 discusses how EPA addresses long-run market adjustment as part of its analysis, as well as the potential for operations to pass on costs incurred to comply with the final regulations. Response to comment DCN CAFO200139-4 discusses how EPA addresses available cost share assistance from Federal and State farm conservation programs as part of its economic analysis. Response to comment DCN CAFO202615-21 discusses how EPA’s analysis accounts the nutrient value of manure and potential income from manure sales as part of its economic analysis.

2.4.3.1 Market Impacts on Facility Income

For the 2001 Proposal, EPA presented the results of its economic impact analysis both assuming no long-run market adjustment or cost passthrough (i.e., the highest level of financial effects projected) and some degree of cost passthrough. However, because of uncertainties regarding how and when much market adjustments would occur and whether this would actually offset estimated compliance costs incurred by CAFOs, EPA’s determination of whether the regulation is “economically achievable” did not rely on assumptions of cost passthrough an offset to estimated compliance costs as part of its regulatory analysis and therefore reflects the highest level of impacts projected.

In general, EPA measures the financial effects of the final regulations on the basis of the estimated compliance costs incurred at the CAFO. However, other mitigating factors could influence what costs the CAFO ultimately incurs because a portion of these costs might eventually be passed on through the food marketing chain. Passthrough of compliance costs might occur in the long run through market adjustment (higher prices through changes in supply and demand) or in the shorter term as processors take steps to ensure a steady and continued supply of raw farm input (raise production prices for live animals or animal products produced by CAFOs). For the purpose of this analysis, EPA examines regulatory impacts on producers in the livestock and poultry sectors under the assumption that they will experience increased revenues due to long-run market adjustment and resultant higher market prices. This section presents an overview of this analysis.

Individual farms may be considered competitive and may not individually be able to raise prices. Collectively, however, if production costs rise across the industry as a whole, economic theory indicates that prices will rise. Essentially, if farmers cannot earn a sufficient return to cover all long-run costs of production, they will leave the market. This action, in turn, will force customers to pay a higher price to purchase the quantity of the product they desire. (This is illustrated in Figure C-1 of Appendix C of this report). As the final regulations result in an increase in production costs, the supply curve for the market shifts upward. The magnitude of this shift is equal to annualized compliance costs per unit sold (CC/Q). Because the supply curve reflects long-run production costs, this change represents the minimum price necessary to ensure adequate supply of the product. Market price will rise from P^0 to P^1 in the long run.¹⁸ Intuitively, the effect of the final regulations on market prices can be measured (as shown in Figure C-1) as the increase in market price ($P^1 - P^0$) relative to compliance costs per unit of production (e.g., head of cattle):

$$\text{market price increase as percent of unit compliance costs} = \Delta P_{CC} = \frac{(P^1 - P^0)}{\frac{CC}{Q}}$$

Table 2-9 shows, for example, that the measured price increase as a percent of unit compliance costs equals 70.7 percent for beef cattle. That means if the final regulations cause farmers to incur compliance costs of \$1.00 per head of cattle, then the resulting decrease in cattle supply causes the market price to increase by about \$0.71 per head. In general, the magnitude of this effect will vary according to market-specific conditions.

EPA thoroughly examined this issue during the development of the proposed rulemaking, as documented in Section 10 of the proposed rule preamble as well as in the Proposal EA (Sections 2 and 4 and Appendices B and C). In the industry profile and data sections of the Proposal EA, EPA readily acknowledged limitations of incorporating assumptions of cost passthrough in the analysis, given existing dynamics in these industries. EPA's industry profile in the Proposal EA acknowledged many of the reasons why farmers may be limited from passing on higher operating costs, including the perception that farmers are price takers and have limited negotiating power to pass on costs or negotiate higher product prices, attributable in part to imperfect market conditions characterized by conditions of oligopsony/monopsony (i.e., few buyers, many sellers).

To further examine this issue, EPA conducted an extensive review of the agricultural literature on market power and price transmission in each of the livestock and poultry sectors and concluded that there is little evidence to suggest that markets will not adjust to at least partially offset increased production costs to producers. Although there is a potential for market power in each of the animal products industries, and although vertical integration has squeezed the rents out of many farming activities, EPA believes that the literature generally supports the conclusion that the degree of market power in these sectors is not sufficient to prevent increased production costs from being partially offset

¹⁸ Under highly unusual circumstances, market price will not rise in response to increased production costs. First, if demand for a product is perfectly elastic (the demand curve in Figure C-1 in Appendix C is horizontal), consumers, including processors or packers, are not willing to pay more for a product regardless of scarcity. Second, if the supply of a product is perfectly inelastic (the supply curve in Figure C-1 is vertical), the quantity supplied by the producer will not change regardless of price. In the real world, even nearly perfectly elastic demand or nearly perfectly inelastic supply at the sector or industry level for most products in the long run is rare.

by increased market prices for these products, particularly in the long-run, such that prices and quantities will adjust to a post-regulatory equilibrium. A summary of this research is in the rulemaking record (ERG, 2000c—DCN 70640).

Despite EPA's general conclusions based on the empirical research about long-run market adjustment, EPA presented the results of its economic impact analysis both assuming no long-run market adjustment or cost passthrough for the 2001 Proposal, and based its determination of whether the regulation is "economically achievable" without assuming cost passthrough of costs. As noted in the preamble and Proposal EA, many industry representatives opposed assumptions that producers will be able to pass on costs or that compliance costs would be partially offset by higher producer prices, including prices paid to contract growers who raise animals under contract with a meat packer or slaughtering/processing facility. Similar concerns were expressed by many small entity representatives during the Agency's small business outreach process and by members of the Small Business Advisory Review (SBAR) Panel.¹⁹

EPA received several comments on the 2001 Proposal recommending that the Agency not consider cost passthrough as part of its analysis, particularly for its analysis of whether the regulation is economically achievable. (See, for example, NPPC, 2002, NMPF, 2002, National Center, 2002) EPA acknowledges comments pointing out that individual farmers might be unable to influence market or producer prices. EPA also acknowledges, however, comments focused on the relationship between processing firms and producers that raise animals under contract for these firms, citing expectations that future contract negotiations would result in compliance costs will be fairly allocated over time (Wisconsin Department of Natural Resources, 2002). Some stakeholders support assumptions of cost passthrough. During the development of the rulemaking, the Natural Resources Defense Council (NRDC) and interest groups continually requested that EPA consider the financial ties linking processors and contract growers, and the ability within these markets to pass on costs to consumers (see: Weida, 2002; Ikerd, 2002; USEPA, 20021f, NRDC, 1999). Ikerd (2002) notes that "EPA CAFO regulations might logically result in more, smaller, and more-profitable farms" since the regulations "could cause price increases that would more than offset any increase in production costs."

In response to comments on this issue in the 2001 Proposal, the Agency's 2001 Notice of Data Availability (November 21, 2001, 66 FR 58556) EPA restated its intention to consider such analyses for the final regulations as part of its economic analysis, expecting to obtain additional comment on this issue (66 FR 58581). The 2002 Notice of Data Availability (July 23, 2002, 67 FR 48099) further discusses adjustments to the Agency's approach to conduct this analysis (67 FR 48107). The approach presented would alter the Agency's analysis from an approach that assumes costs are passed on by farmer through the marketing chain to an approach that would instead evaluate financial effects based on assumed changes in prices received by producers as a result of long-run market adjustment.

Appendix C of this report describes EPA's approach to evaluate the effects of long-run market adjustment and changes in facility level income under a post-compliance scenario for this analysis. To conduct this analysis, EPA estimates changes in farm level prices using its market model analysis (described in Section 2.5 of this report). EPA's market model uses baseline equilibrium price and quantity, as well as equations representing estimated supply and demand responses to changes in price.

¹⁹These comments note that integrators have a bargaining advantage in negotiating contracts, which might ultimately allow them to force producers to incur all compliance costs, as well as allow them to pass down to growers any additional costs that might be incurred by the processing firm.

This model is specified for each livestock and poultry industry affected by the final regulations. The market model uses estimated compliance costs per unit of production for the final regulations to measure the vertical shift in the supply curve. Given the vertical shift in the supply curve, the model solves for the post-regulatory equilibrium price. Thus, all components of this supplemental analysis are baseline parameters, inputs, or outputs of EPA's market model. This approach reflects an adjustment to what was done for the 2001 Proposal by using predicted price changes from the market model analysis to calculate the effect of this change on the CAFO level financial analysis (focusing on the revenue rather than the cost side of the analysis). Such an approach is more consistent with previous regulatory analyses conducted by EPA's effluent guideline program (e.g., USEPA, 1999a—65 FR 49686). This change was noted in the 2002 Notice (67 FR 48106-48107).

Table 2-9 shows the selected price elasticities of supply and demand that EPA assumes for each sector, along with the resultant estimate of the price increase as a percent of per unit compliance costs based on these estimates using the approach outlined in this section.

Section 4.4 and Appendix B of the Proposal EA describe EPA's market model for this analysis, providing a detailed overview of the data and the methodology underlying this approach. Section 4.2.6 and Appendix C of the Proposal EA provide additional information on the supply and demand elasticities compiled to evaluate long-run market conditions following promulgation of the final regulations.

Although many comments generally concurred with EPA that long-run market adjustment will occur, EPA agrees with concern expressed by these commenters about short-run impacts at regulated CAFOs and agrees that the results of a cost passthrough analysis must be interpreted cautiously. Given the uncertainty of whether CAFO level income will rise in response to long-run market adjustment, however, EPA presents the results of this analysis assuming both some degree of cost passthrough and no cost passthrough (the highest level of impacts projected).

EPA agrees that over the long-run the aggregate effect of many individual farmer's response to the regulations will cause market prices and quantities to adjust. This long-run market adjustment will lessen the economic impacts of the final regulations over time. EPA also agrees with comments that predict contract price negotiations between processing firms and their contract growers that will ensure continued and steady supply of animals for further processing. However, EPA decided not to base its statutory analysis of "economic achievability" on assumptions of long-run market adjustment because continued long-run changes are difficult to predict and therefore cannot be readily incorporated into EPA's regulatory analysis as an offset to estimated compliance costs at all regulated facilities. EPA also agrees with comments noting that an analysis that takes into account broader long-run market adjustments might mask severe financial effects at regulated CAFOs in the short-run. Accordingly, EPA has undertaken its main analysis as a short run analysis of the financial effects at regulated CAFOs. The results of this analysis are available in Section 3.3.2 of the Final EA and presents the results of EPA's economic achievability analysis before any longer-run revenue effects are realized. See Section 3.3 of this report. Although EPA's short-run model provides a reasonable means to approximate CAFO level effects taking into account market changes associated with long-run adjustment (when coupled with results from a market model analysis and other published information from various land grant universities), this model is not specifically designed to precisely capture such long-term effects.

To the extent that EPA's analysis considers assumptions of long-run market adjustment as part of a supplemental analysis, the Agency agrees with comments that the results of this analysis must be interpreted cautiously. Because long-run market adjustment will likely lessen the economic impacts of

the final regulations over time (in conjunction with offsetting cost share and technical assistance), EPA believes that the results of its analysis to determine “economic achievability” is sufficiently conservative and depicts the highest level of potential effects. The results of the Agency’s supplemental analysis assuming some degree of long-run market adjustment is viewed as providing a realistic lower bound estimate of financial effects of the regulation. Section 2.4 of the Final EA discusses how EPA incorporates these assumptions in its analysis, while addressing the constraints of such an analysis. Appendix C of this report describes EPA’s approach to evaluate the effects of long-run market adjustment and changes in facility level income under a post-compliance scenario.

EPA continues to present its analysis results both assuming no long-run market adjustment and some degree of long-run market adjustment. EPA also continues to base its determination of whether the regulation is “economically achievable” without relying on assumptions of long-run market adjustment as an offset to estimated compliance costs in the short-run.

Table 2-9. Selected Elasticity Estimates and Estimated Regulatory Price Effect

Animal Sector	Selected Price Elasticity of Supply ^{a/}	Selected Price Elasticity of Demand ^{a/}	Price Increase as Percent of per unit Compliance Costs
Beef	1.020	-0.621	70.7%
Dairy	1.527	-0.247	84.8%
Hogs	0.628	-0.728	69.7%
Broiler ^{b/}	0.200	-0.372	68.7%
Layer	0.942	-0.110	93.7%
Turkey	0.200	-0.535	49.5%

Sources: Various (ERG, 1999a, 199b); also see summary in Appendix C in Proposal EA (USEPA, 2001a)

^{a/}Elasticities representing a consensus of expert opinion (Vukina, 2000; Foster, 2000a).

^{b/}Includes elasticity estimates for both broilers and chickens because studies vary between the two terms when analyzing the markets for meat from chickens.

2.4.3.2 Cost-Share Assistance

For the 2001 Proposal, EPA presented the results of its economic impact analysis without considering the potential offsetting effects of cost-share and technical assistance from various Federal, State, and local farm conservation programs, due to uncertainties regarding who and how much cost share and technical assistance farmers receive and whether this would actually offset estimated compliance costs incurred by CAFOs. EPA’s analysis to determine whether the regulation is “economically achievable” also did not rely on such assumptions as an offset to estimated compliance costs as part of its regulatory analysis and therefore reflects the highest level of impacts projected.

EPA thoroughly examined this issue during the development of the proposed rulemaking, as documented in Section 4.2 of the Proposal EA and in the rulemaking record (DCN 70130). Various State and Federal programs, such as the Environmental Quality Incentives Program (EQIP) administered by USDA, offer assistance to farmers for on-farm environmental improvements. For example, cost sharing

for eligible producers under EQIP may cover up to 75 percent of the costs of certain conservation practices, such as grassed waterways, filter strips, manure management facilities, capping of abandoned wells, and other practices important to improving and maintaining the health of natural resources in the area. Technical assistance is also available for formulating conservation plans. Previous regulatory analyses by the land grant universities and USDA have included cost-share program dollars as an offset to compliance costs associated with environmental regulation or at least consider available government assistance as part of an overall assessment (see literature review, DCN 175100). Also, a 1995 regulatory analysis of confined animal operations located in coastal zone areas, conducted by both USDA and EPA assumed a maximum cost sharing amount of \$3,500 per year in government cost-sharing (Heimlich and Barnard, 1995; DPRA, 1995).

For reasons outlined in Section 4.2 of the Proposal EA (and detailed in DCN 70130), EPA decided not to consider cost share assistance as an offset to estimated compliance costs in determining whether the regulation is “economically achievable.” Reasons for this include the following: (formerly) lower EQIP funding levels would be insufficient to cover all new applicants that might be affected by the final regulations, (formerly) strict eligibility requirements would limit larger-sized operations from participating in the program²⁰ and limiting the types of practices covered, waiting lists to participate in the program would be long and geographic priority areas were established, thus limiting access to some producers, among other factors limiting participation.

EPA received several comments on the 2001 Proposal supporting the Agency’s decision not to consider include cost sharing to offset compliance costs faced by CAFOs (see, for example, DCN 201734, DCN 400158, DCN 400125, DCN 201717, DCN 400140, DCN 235769). EPA received few comments on the 2001 Proposal that support this assumption.

The 2001 Notice discussed the possibility that EPA would consider such analyses for the final regulations as part of its economic analysis (see: 66 FR 58585). The 2002 Notice presented additional information and discusses options for incorporating cost sharing in EPA’s analysis due to increased appropriations and program changes broadening those eligible to participate in the program (67 FR 48106-48107). The 2002 Notice discusses new farm bill legislation passed by Congress in Spring 2002 that could significantly raise government expenditures for USDA conservation programs. Specifically, total EQIP authorization for FY 2002-2007 is \$5.8 billion, ranging from \$400 million to \$1.3 billion per year over the period. The current authorized levels are about \$200 million per year. The new legislation targets 60 percent of available EQIP funds to livestock and poultry producers, including confinement and grass-based systems (the latter accounting for about 70 percent of total livestock and poultry operations). The new legislation also removed the previous eligibility requirements under EQIP that restricted funding for certain structural practices to operations with fewer than 1,000 animal units (as measured by USDA), replacing this with an overall payment limitation of \$450,000 per producer over the authorized life of the 2002 Farm Bill.

In response to the 2002 Notice, EPA received numerous comments recommending that the Agency account for the availability of cost-share and technical assistance in its regulatory analysis as an offset to estimated compliance costs as well as how producers might use these programs to help secure loans for capital investment associated with regulatory compliance. These comments noted that the debate surrounding these increased funding levels included a focus on assisting producers to comply with

²⁰ Prior to new legislation passed in 2002, EQIP funds were not available to operations with more than 1,000 AU but only to operations with fewer than 1,000 AU (using USDA AU definitions). (See: DCN 70130).

environmental regulations (House Committee on Agriculture, 2002).²¹ NRDC et al. (2002) also noted that industry representative, in their lobbying messages, industry told Congress that producers would need significant boosts in cost-share funds with no size restrictions on subsidy eligibility in order to comply with EPA's new CAFO regulations.²² Despite these legislative changes, however, the majority of comments received by EPA on the cost-share issue continue to oppose the use of cost share assumptions as part of the analysis because of continued uncertainties about the availability and adequacy of funds, as well as administrative changes being considered in USDA's conservation programs. See comments by land grant universities (DCN 600046 and DCN 600038) and State governments and agriculture agencies (eg., DCN 600057, DCN 201716, DCN 400165, DCN 400249, and DCN 600049-7).

EPA agrees that program changes and increased funding in EQIP and other USDA conservation programs will benefit farmers and might offset compliance costs incurred by some facilities under the CAFO regulations. However, EPA disagrees that these legislative and program changes can be readily incorporated into EPA's regulatory analysis and will offset compliance costs at all regulated facilities.

EPA decided not to base its statutory analysis of "economic achievability" on assumptions of cost sharing because of continued uncertainty about how to incorporate such assumptions into its analysis. A number of uncertainties continue to constrain EPA's ability to simply incorporate cost share assumptions into its economic analysis. Such factors include uncertainty about actual funding levels, the share of program dollars allocated to confinement facilities (compared to all livestock and poultry operations, including non-confinement and grazing operations), the share of program dollars allocated to larger-sized operations (compared to smaller-sized operations), restrictions and eligibility requirements on the types of waste management practices covered, and availability of USDA technical personnel to implement the recent legislative changes in the near term. USDA is also considering administrative and programmatic changes to its conservation programs, making it difficult to know how the program will actually be implemented. For example, recent actions by USDA have sought to restrict cost share assistance to 50 percent of the capital expenditure on funding levels exceeding \$100,000 per facility. Because EPA is unable to reasonably account for each of these factors and accurately incorporate assumptions of cost sharing addressing the uncertainty surrounding these factors, EPA decide not to base its statutory analysis of "economic achievability" on assumptions of cost sharing. EPA believes that the uncertainty regarding actual funding levels and implementation of the recent Farm Bill make less conservative assumptions more difficult to justify when economic achievability is assessed.

For these reasons, EPA continues to base its determination of whether the regulation is "economically achievable" without relying on assumptions of cost share assistance as an offset to estimated compliance costs. Because EPA recognizes that cost share assistance from Federal and State farm conservation programs will likely lessen the economic impacts of the final regulations over time (in conjunction with long-term market adjustment), however, the Agency now presents its analysis results

²¹ The Congressional record on the Farm Bill: "As legislation was developed to improve EQIP and provide additional resources to it, Congress was specifically concerned about how the U.S. livestock industry would meet the new Clean Water Act requirements on animal feeding operations" (Cong. Rec. at H1923, May 1, 2001).

²² See letter from National Cattlemen's Beef Association, National Chicken Council, National Milk Producers Federation, National Pork Producers Council, National Turkey Federation, The Alliance of Western Milk Producers, and United Egg Producers to U.S. Senators (NCBA et al., 2001); testimony by National Pork Producers Council and National Cattlemen's Beef Association, Committee on Agriculture, Nutrition and Forestry, U.S. Senate (NPPC, 2001a; NCBA, 2001a).

both assuming some degree of cost share assistance and no cost share assistance (i.e., the highest level of financial effects projected). EPA believes that the results of its analysis to determine “economic achievability” is sufficiently conservative and depicts the highest level of potential effects. The results of EPA’s supplemental analysis assuming some degree of cost sharing is viewed as providing a realistic probable alternative estimate of financial effects of the regulation among some operations. However, because EPA’s supplemental analysis does not consider the maximum cost-share assistance possible (\$450,000 per producer over the authorized life of the 2002 Farm Bill), this estimate should not be regarded as the potential low bound estimate among all operations.

2.4.3.3 Value of Manure as Cost Offsets

During the development of the 2001 Proposal, EPA considered whether to assume that beneficial uses of manure might offset incurred compliance costs as part of the Agency’s economic analysis. This analysis consists of two components: (1) the nutrient value of manure for use as a fertilizer substitute of organic matter and (2) the potential income from manure or litter sales, particularly of relatively higher value dry poultry litter. Research conducted by the land grant universities and USDA often provide for some accounting of the benefits associated with efficient manure use (see a literature review conducted by EPA at DCN 175100 in the rulemaking docket). However, because there is not an established market for manure and the value of manure is uncertain or variable, EPA’s determination of whether the regulation is “economically achievable” does not rely on assumptions of manure sales as part of its regulatory analysis and therefore reflects the highest level of impacts projected.

For both the proposal and final rule analysis, EPA’s regulatory cost estimates take into account the nutrient value of manure for use as a fertilizer substitute to meet the nutrient needs of crops raised by the regulated CAFO. This analysis estimates the incremental cost of the land application requirements, accounting for various baseline practices of what farmers are doing currently in the absence of regulation. Because livestock and poultry operations currently use manure nutrients as a fertilizer source on crops grown on-site as a baseline practice, this analysis incorporates assumptions of the nutrient value of manure for use as a fertilizer substitute to meet the nutrient needs of crops raised by the regulated CAFO. The general approach used by EPA to assess the nutrient value of manure is consistent with approaches used by USDA (Kellogg et al., 2002; Kellogg et al., 2000). Information on EPA’s approach to assess the nutrient content of manure for use as a fertilizer substitute is available in Section 21 of the rulemaking record and in the Development Documents and Cost Report (see: USEPA, 2002).

For the proposal, EPA also conducted a supplemental economic analysis that considered the potential income that might accrue to regulated CAFOs should that operation be able to sell any additional manure nutrients in excess of the nutrient needs of crops raised by the CAFO to other agricultural businesses. This supplemental analysis presented the results of its economic impact analysis both assuming no income from manure sales (i.e., the highest level of financial effects projected) and income from sales of manure in excess of the crop needs at the CAFO. For this analysis, EPA did not adjust or offset its estimated costs associated with managing, storing, hauling, processing, and distributing excess manure nutrients off-site as part of this analysis. This analysis evaluated only the income that might be generated from the sale of this excess manure based on the market value for nitrogen, phosphates, and potassium in commercial fertilizer. Also, EPA conducted this analysis for the poultry sectors only, because of the typically higher value of dry poultry manure and litter; e.g., in the broiler sector, EPA’s supplemental analysis shows that sales of dry poultry manure could offset up to 50 percent of the estimated compliance costs (see Section 6 of the Proposal EA). Although EPA does

believe that the other livestock operations might also benefit from the sale of animal manure, the Agency chose not to evaluate such a scenario because of inadequate market indicators for the wetter manures that are common in the hog and dairy sectors and for dry manure collected at fed cattle operations. Because there is not an established market for manure, however, EPA's determination of whether the proposed regulation is "economically achievable" did not rely on assumptions of manure sales as part of its analysis. Information on EPA's supplemental economic analysis of the potential income that might accrue to regulated CAFOs should that operation be able to sell excess manure nutrients is available in Section 6 of the Proposal EA.

EPA received several comments that were generally opposed to EPA's consideration of the nutrient value manure, particularly about the Agency's monetary assessment of manure's value for consideration as an offset to estimated compliance costs of the rule. Few comments endorsed the concept of assuming the collateral benefit of considering manure as an offset the cost of compliance with this regulation. Following proposal, EPA further evaluated the potential income generated and/or cost savings to an operation from the sale or use of manure by the CAFO as a fertilizer substitute. EPA's 2001 Notice discusses options to include an analysis based on the volume of manure nutrients estimated for each representative CAFO model adjusted by the average value for these nutrients, according to, for example, market value for nitrogen, phosphates, and potassium. The 2001 Notice solicited public comment on these estimated values and data that EPA had considered for this analysis (see both 66 FR 58575 and 66 FR 58585), soliciting further comment on possible analytical approaches and assumptions.

EPA disagrees with comments that it should not consider the nutrient value of manure for use as a fertilizer substitute as part of its analysis of the compliance costs associated with the regulations. EPA's analysis estimates the incremental cost of the rule need by accounting for baseline practices based on what farmers are doing currently in the absence of EPA's regulation. Because livestock and poultry operations currently use manure nutrients as a fertilizer source on crops grown on-site as a baseline practice, this analysis incorporates assumptions of the nutrient value of manure for use as a fertilizer substitute to meet the nutrient needs of crops raised by the regulated CAFO. For this analysis, EPA assumes that CAFOs use manure generated as a fertilizer substitute on cropland under the control of the CAFO. This analysis fully considers all estimated costs associated with managing, storing, hauling, processing, and distributing excess manure nutrients off-site, and does not assume that these costs are offset by the nutrient value of the excess manure. Therefore, EPA disagrees with comments suggesting that the Agency has not considered the increased cost of using manure due to added costs attributable to the regulation. This analysis also accounts for the cost of additional fertilizer purchases, to the extent that it is needed to supplement manure that may need to be applied at different rates as a result of this rule (e.g., under a phosphorus standard, more commercial fertilizer may be needed to supply nitrogen needs to crops).

EPA acknowledges concerns expressed in comments about the possibility that the methodology used by the EPA for valuing manure nutrients might overstate the market value of manure. The approach that EPA uses to approximate the nutrient value of manure—based on the value of commercial fertilizer values of nitrogen, phosphorus, and potassium—is consistent with research conducted by USDA and land grant universities. Other market data and approaches for approximating the nutrient content of manure are not available and alternative data and approaches were not recommended to EPA during the public comment period. Information was also not submitted to EPA substantiating claims that the Agency has grossly overstated the nutrient value of manure for the purposes of its costing analysis. EPA also received no information to support claims that some farmers can obtain spread manure at no cost from other sources, and that therefore the CAFO's own supply of manure has zero value since it

substitutes for a free input. Finally, EPA disagrees with comments that it has not appropriately accounted for differences in the fertilizer value of manure based on the specific circumstances of each farm; such differences are accounted for using a representative farm approach that closely approximates the range of variability among farming operations. Use of such a representative farm approach to approximate a range of farming conditions is consistent with and research conducted by USDA and the land grant universities.

For more information on issues pertaining to the nutrient value of manure, see EPA's response to comment CAFO400112-52. Also see the response to comment CAFO 201141-2 for a discussion of how commercial fertilizer use is addressed by the nutrient management plan.

EPA agrees, however, with comments that caution against assuming that the nutrient value of manure will provide a source of income that will offset compliance costs, particularly as part of the Agency's analysis to assess regulatory impacts. Upon further review, EPA decided not to consider income from manure sales as part of its analysis because of uncertainty associated with incorporating such assumptions into the analysis. The main basis for this decision is the absence of established markets and a cash market price for spreading manure. Manure markets are presently functional, but remain largely under-developed and are not well established. In the absence of data under such market conditions, the true market value for manure and manure nutrients is uncertain or variable. Other marketing factors, such as distance from the source of manure to the application site and other site specific conditions, regional markets conditions, manure products applied, life cycle of the feeding operation in regards to the growing season, weather conditions, make such assumptions difficult to measure. Because true market value for manure is unknown, EPA assumes commercial fertilizer values (of nitrogen, phosphorus, and potassium) for approximating the nutrient value of manure. Although such an approach is consistent with practices used by researchers at USDA and the land grant universities, EPA recognizes that the value of manure might be misrepresented using this approach. In cases where there might be little or no positive cash market price for spreading manure, this approach would overstate its value. Use of this approach might also be inconsistent with the context in which manure is used; that is, some CAFOs may spread manure as a means of disposal, with the optimal application rate being that which satisfies crops needs at the lowest cost. Also, some operations may already be benefitting from manure as a potential income source; therefore, this income may already be reflected in the baseline financial data and any potential revenue from manure sales would not result in additional incremental income to a regulated CAFO.

Although EPA disagrees with comments suggesting that it has not considered the increased cost of using manure due to added costs associated with managing, storing, hauling, processing, and distributing excess manure nutrients off-site to comply with the regulation, it agrees with recommendations by USDA researchers that should EPA consider the revenue from the sale of manure as part of the analysis, then it should also consider any additional incurred costs (e.g., payments to crop growers to accept manure, in some cases). To date, EPA has not accounted for such additional costs. EPA also acknowledges comments noting that because the rule will not result in an (incremental) increase in the value of manure, it should not account for incremental offsetting costs.

Finally, EPA acknowledges concerns expressed by some commenters that the final rule might negatively affect the market for manure and manure nutrients. These commenters believe that the regulations will reduce or eliminate the inherent market value of manure by restricting the amount of manure that can be applied on available land, thus reducing the demand for manure nutrients and creating additional manure nutrient surpluses. These commenters claim that this might also increase the incentive

for CAFOs to subsidize the use of such manure, thus further increasing the CAFO's disposal costs. Many of these commenters claimed that such effects would be more pronounced under a phosphorus-based standard than under a nitrogen-based standard. Given the possibility that the value of manure may decline as a result of this rule, at least in the near term, EPA decided not to calculate the potential benefits from manure sales using current available data and approaches to approximate the potential market value of manure. Alternative market data and information to support an analysis assuming additional income from the sale of excess manure are not available and were not recommended to EPA during the public comment period.

Because of the inherent difficulties of conducting such an analysis and because of the possibility that the available data and analytical approaches might misrepresent the market value of manure nutrients, EPA's analysis of the final rule does not consider the potential income generated from the sale of manure as an offset to estimated compliance costs. Therefore, EPA continues to base its determination of whether the regulation is "economically achievable" does not rely on assumptions of manure sales as part of its regulatory analysis and therefore reflects the highest level of impacts projected. Despite this limitation of EPA's analysis, the Agency believes that some operations will benefit from the sale of excess manure and that the results of its analysis to determine "economic achievability" is sufficiently conservative and depicts the highest level of potential effects.

2.5 METHODOLOGY TO ASSESS BROADER MARKET LEVEL EFFECTS

EPA's CAFO level analysis measures the economic effects on regulated facilities. As these effects influence the decisions of farmers, processors, packers, and ultimately consumers, they translate into changes in the price and quantity of farm commodities and retail foods and generate changes throughout the national economy. To better understand the potential impacts, EPA conducts a market level analysis. Section 2.5.1 provides an overview of EPA's market model and input-output model to evaluate broader market level effects and it describes the input data and parameters for these models.

EPA did not receive comments that directly criticize the underlying data and modeling framework used to conduct this analysis. However, comments were submitted that question the appropriateness of EPA's modeling results, focusing on effects to regulated CAFOs and also regions and local communities. Section 2.5.2 discusses EPA's response to these comments. For more information see response to comments DCN CAFO 201438-186, DCN CAFO 400120-20, and DCN CAFO 201352-101 available in the Comment Response Document.

2.5.1 Market Model Methodology and Input Data

EPA's market analysis evaluates the effects of the final regulations on national markets based on the estimated total annual industry compliance costs (presented in Section 3.5 of this report). EPA's market model analysis predicts the effects of the final regulations on national markets in terms of the broader market changes that might result due to compliance with requirements. This analysis examines changes throughout the economy as impacts are absorbed at various stages of the food marketing chain. The analysis is intended as a long-run analysis to show impacts of the regulations on society, including effects on price and quantity. Other market changes examined by EPA include changes in regional employment and changes in U.S. livestock and poultry trade (imports and exports). This analysis uses national level production and employment impacts to approximate potential regional impacts at the community level effects.

The analysis uses a linear partial equilibrium model adapted from the COSTBEN model developed by the USDA's Economic Research Service (Hahn, 1996a, 1996b). The modified EPA model provides a means to conduct a long-run static analysis to measure the market effects of the final regulations in terms of predicted changes in farm and retail prices and product quantities. Appendix B of the Proposal EA provides a more detailed discussion of the market model's structure and operation. The market model assesses the estimated direct impacts associated with complying with the CAFO regulations, measured in terms of dollars of industry output per year. This approach allows EPA to compute market level changes in terms of changes in consumer and farm level prices for the selected products and changes in the amount of commodities produced and traded internationally (expressed as changes in U.S. product exports and imports).

Once the changes in output (price times quantity) are estimated using EPA's market model, EPA evaluates these changes using input-output multipliers to estimate the ripple effects as changes in one industry pass through its suppliers and the rest of the economy. Input-output analysis uses multipliers that forecast how much more or less output the whole economy would produce as a result of each dollar increase or decrease in spending by a given industry. For this analysis, EPA uses multipliers from the Regional Input-Output Modeling System, version 2 (RIMS II) (USDC, 1997, 1996) to estimate the impact on the national economy of changes in the animal products industry. Multiplying the original change by the multiplier gives a measure of the total direct effects (on immediate suppliers), indirect effects (on the suppliers' suppliers and all other industries), and induced effects (on households' spending and labor decisions). These estimates might be driven by an original change in final demand, output, earnings, or employment and yield results in terms of final demand, output, earnings, tax revenue, or employment changes. Estimated effects include changes in national employment (measured in terms of full-time equivalents) and changes in economic output (measured in terms of changes in Gross Domestic Product).

The data EPA collected to conduct this analysis span a wide range of primary and secondary data sources from USDA, the U.S. Department of Commerce's Bureau of Labor Statistics (BLS), various land grant universities, industry, and other sources, as documented in the Proposal EA. EPA uses 1997 as the base year, which is consistent with the engineering cost estimates that reflect 1997 conditions. The input data EPA uses for this analysis are presented in Tables 2-10 and 2-11 of this report. Detailed citations for each base year value appear in Section 4.4 and Appendix B of the Proposal EA (USEPA, 2001a). The Proposal EA provides additional detail on this approach, explaining EPA's justification for the approach as well as the theoretical concepts underlying the analysis.

Market data used as inputs to this model are from a wide range of USDA data and land grant university research. In keeping with the focus of this market analysis, the supply and demand elasticities used are long-run elasticities, rather than short-run elasticities. Short-run elasticities are not considered appropriate for this analysis (see response to comments DCN CAFO 400120-20 in the EPA's Comment Response Document). The approach used for EPA's market level analysis is discussed in greater detail in Section 4.4 of the Proposal EA (USEPA, 2001a). Section 4.4.1 of the Proposal EA presents an overview of the model and Section 4.4.2 presents the data sources used for the analysis.

In general, EPA also considered whether the final regulations could have community-level and/or regional impacts, e.g., if they substantially alter the competitive position of livestock and poultry production across the nation, or lead to growth or reduction in farm production (in- or out-migration) in different regions and communities. Ongoing structural and technological change in these industries has

influenced where farmers operate and has contributed to locational shifts between traditional production regions and the emergent, nontraditional regions. Production is growing rapidly in these regions because of competitive pressures from more specialized producers who face lower per-unit costs of production. This is especially true in hog and dairy production (El-Osta and Johnson, 1998; McBride, 1997; Iowa State University, 1998; Martinez, 1999). EPA believes that the regulations would not have a disproportionate effect on regions and communities.

The general market model framework EPA uses does provides a means to evaluate regional and community level effects. To do this, EPA distributes national employment estimates on a regional basis using state level production data for larger-sized livestock and poultry operations for each sector. The data EPA uses to allocate national employment impacts in the agriculture sectors are from the 1997 Census (USDA/NASS, 1999a) with imputed values to correct for omitted values (Westat, 2000), supplemented with other state level data from USDA (USDA/NASS, 1998b). The approach EPA used approximates changes in regional employment by disaggregating the national employment reductions (both direct and indirect) to indicate regions where impacts of the final regulations are most likely to occur. For each animal sector, EPA distributes the national direct employment impacts at the CAFO and processor/wholesale level onto a regional basis using state level data that reflect livestock and poultry production by the largest facilities in each state. These data include the 1997 Census (USDA/NASS, 1999a) and other USDA data (USDA/NASS, 1998b), with imputed values for omitted USDA data (Westat, 2000). EPA allocates total national indirect and induced employment changes onto a regional basis according to each state's share of 1997 total U.S. population as reported for 1997 from U.S. Census data (U.S. Census Bureau, 1999). The direct and indirect/induced results are summed to calculate the total impact for each state. EPA evaluates regional impacts from these state level estimates, aggregated to USDA's farm production regions, as shown in Figure 2-1 of the Proposal EA.

The available approach discussed in this EA and the best available data for EPA to evaluate these concerns, however, are not sufficient to more precisely assess community or regional impacts.

Nevertheless, EPA concludes from its broader-based analysis that regional and community level effects are estimated to be modest, but do tend to be concentrated within the more traditional agricultural regions. EPA does not expect that this rule will have a significant impact on where animals are raised. On one hand, on-site improvements in waste management and disposal, as required by the final rule, could accelerate recent shifts in production to more nontraditional regions as higher-cost producers in some regions exit the market to avoid the relatively high retrofitting costs associated with bringing existing facilities into compliance. On the other hand, the final regulations might favor more traditional production systems where operators grow both livestock and crops, since these operations tend to have available cropland for land application of manure nutrients. These types of operations tend to be more diverse and less specialized and, generally, smaller in size. Long-standing farm services and input supply industries in these areas could likewise benefit from the final rule, given the need to support on-site improvements in manure management and disposal. Local and regional governments, as well as other nonagricultural enterprises, would also benefit.

2.5.2 Public Comments on EPA's Market Analysis

EPA received public comments on its market model approach that question the appropriateness of EPA's market model. These comments focus mostly on the implications of the Agency's assessment of the potential effects to regulated CAFOs and also the broader effects of the regulations on regional markets (especially local communities and agricultural support industries). For more information, see

response to comments DCN CAFO 201438-186, DCN CAFO 400120-20, and DCN CAFO 201352-101 available in the Comment response Document.

Most commenters recognize the distinctions between prices as observed by individual farms and prices at the aggregate level and generally concur with EPA that over the long run, prices and quantities will adjust to a post-regulatory equilibrium (see, for example, NMPF, 2001; FAPRI, 2001a; National Center, 2002). However, these commenters expressed concern about short-run impacts. (Short-run impacts on farms are assessed using the approach described in Section 2.3, which details the Agency's approach for determining economic achievability; see Section 3.3.) Some commenters recommended that EPA consider using a more complicated modeling approach (NMPF, 2001), such as that used by FAPRI in its parallel analysis conducted of the proposed CAFO regulations. Other commenters noted that EPA's model does not capture supply and demand shifts that might occur among species (e.g., NMPF, 2001a).

Another commenter requested that EPA perform a detailed assessment of impacts on individual communities and regions (National Center, 2002—DCN 400159). This commenter recommended that EPA further analyze and report results by geographic location based on the number of CAFO enterprises and their respective volumes of animal production that are expected to experience financial stress as a result of the final regulations. This commenter also pointed to FAPRI's analysis that indicates that financial stress would be clustered in some regions rather than spread uniformly across the country. The commenter recommended that EPA more closely evaluate the quantity of income, employment, and tax base lost on those farms that are determined to go out of business to calculate the multiplier effects in the surrounding community. See response to comment regarding EPA's analysis of the effects of the regulation on regional or community level effects (DCN CAFO400159-26).

EPA disagrees that using an alternative modeling approach is preferable to the model EPA's uses. Alternative modeling approaches—such as that used by FAPRI—do not produce results that are radically different from EPA results, as confirmed by FAPRI itself (see: DCN 235619). Although EPA uses a static model, rather than a dynamic model, this model was developed and used by USDA to evaluate the effects of changes in policy on the U.S. economy. This model is readily available and usable, provided at no charge by USDA, and is available in EPA's record for full public review and comment. FAPRI's model is proprietary and access to its use is restricted; also, FAPRI has not provided EPA the opportunity to submit their model for public review and comment in order to meet the Agency's administrative requirements for public notice. Finally, use of USDA's standing model has the added benefit of being simpler to operate, whereas FAPRI's model consists of a large scale econometric model of both U.S. and world agriculture containing roughly 5,000 behavioral equations and identities. See also response to comment DCN CAFO201352-136-4 regarding recommendations to use data and modeling techniques similar to FAPRI.

EPA believes that comments expressing concerns about the inability of EPA model to account for interspecies shifts in supply and demand (e.g., shifts in demand between products that might be considered close substitutes, such as beef and pork) are overstated. EPA readily acknowledged that its market model is not able to account for interspecies shifts in supply and demand in Section 2 and Appendix C of the Proposal EA. EPA decided not to account for inter-species shifts among different sectors in order to avoid making large-scale changes to USDA's COSTBEN-type framework. As a result, EPA's analysis may not fully capture cases where price or production costs changes in one sector may cause a shift in production from one commodity to another. However, EPA does not believe that such effects, though probable, are likely to be significant and substantially alter EPA's analysis of these

regulated sectors. Given the overall modest effects predicted for these final regulations (presented in Section 3 of the Final EA) such shifts would likely be very minimal. First, available USDA estimates of the cross-price elasticity of demand for these products tend to be small, even for close substitutes such as beef and pork (see DCN 70336), such that a change in the price of beef will have a relatively small impact on the demand for pork. Second, because EPA is regulating each of these sectors more or less equally, such that changes in production costs within one sector should not cause producers to shift from one sector to another. Also, because cross-price elasticities tend to be of similar magnitude across these food commodities, the net effect in shifts in demand between species will likely be minimal. Finally, because Americans are among the largest consumers of meat, dairy, and poultry products in the world, EPA believes that the strength and size of the U.S. market will cause markets to adjust over time and act to offset higher (short-term) costs. There have been ongoing changes in consumer demand trends, however, that are independent from EPA's regulation. For example, in the past few decades there has been a steady shift in the demand from the consumption of red meat to poultry products, and also shifts away from the demand for other products, such as eggs and some types of dairy foods. Accounting for these other factors affecting overall consumer demand—independent of the effects of EPA's regulation—are difficult to predict. The effects of the international demand for these products are also uncertain, given a wide range of market factors (e.g., relative prices and exchange rate effects, acceptance of U.S. foods abroad due to growing reluctance to U.S. hormone use and genetically modified foods, existing international trade restrictions, etc.).

In response to comments expressing concern over the time frame of the elasticity measure that were used to analyze market level effects, EPA disagrees with the comments that EPA should use short-run elasticities rather than long-run elasticities for EPA's market level analysis. EPA's market model is intended as a long-run analysis to assess potential changes in overall supply and demand conditions from EPA's regulations within the affected markets, including changes in prices and produced and traded quantities, as well as other market changes. Use of long-run elasticities are more appropriate to estimate market equilibrium effects on the U.S. economy. In the nearer term, the regulations should have little effect on prices and quantities. EPA believes that comments concerned about the short-run effects on regulated CAFOs and are more appropriately directed at EPA's CAFO level analysis. By contrast, EPA's market level analysis is intended to assess the market equilibrium effects and other effects on the economy as an additional aspect of the Agency's regulatory impact analysis.

EPA also disagrees that use of long-run elasticities distort EPA's cost estimates for this rule. For this rule, EPA calculates total costs by aggregating facility-level compliance costs estimated across all regulated CAFOs (which are then expressed on an annualized basis). These total costs are based on estimated engineering costs for select representative facilities (comprised of roughly individual 1,600 cost models). Elasticity measures and other market level parameters are not directly factored in this calculation. Also, EPA estimates of total social costs are calculated in terms of pre-tax costs and include broader social costs of the rule. Based on the results of EPA's but also FAPRI's market level analysis, the broader impact of these regulations of national markets are expected to be modest. These results indicate that any additional costs that might be incurred given changes in market conditions, but that are not directly accounted for by EPA's approach, are likely relatively small. Given that the majority of confinement operations (more than 90 percent of all animal feeding operations or AFOs) will not be directly affected by EPA's regulations, EPA believes that any eventual changes in market conditions resulting in higher prices over time might benefit non-regulated AFOs and also regulated CAFOs. See response to comment DCN CAFO 400120-20.

Regarding the Agency's analysis of the regional effects of the regulation, EPA disagrees with comments stating that this analysis does not adequately account for broad differential effects among the animal production regions. EPA acknowledges the merits of comments noting that the size of an operation that goes out of business—based on the number of animals raised at an operation and the resultant change in industry production—is relevant to an assessment of the effects of this regulation on communities and regions (see, for example, comment DCN 400159). However, the available data and the limitations of EPA modeling approach restrict the types of analyses the Agency is able to conduct. Instead, EPA's national level framework uses a representative farm approach to depict baseline financial conditions at representative model CAFOs and to extrapolate CAFO level impacts to all operations nationwide. This approach is not able to precisely measure changes in animal production in conjunction with model facilities that are predicted to close within a specific geographic location. Although EPA's approach may not be appropriate to evaluate the potential effects at an individual affected CAFO or specific effects within a particular production region or farming community, such a broad-based approach is often consistent with other national level policy analyses conducted by researchers at USDA, the land grant universities, and industry analysts.

EPA believes that its analysis meets the Agency's obligation to perform a reasonable analysis with the best data EPA can obtain. A more in-depth and detailed study of these effects on individual communities and regions is not feasible given limited available data and information. Data necessary for a more detailed study would require a census or full survey of these industries, stratified by geographic location, indicating a full range of characteristics specific to an operation's production system, including financial status. This is the type of information that EPA gathers in its Section 308 survey. This information, along with an engineering assessment of what would be required under alternative regulatory options, would provide the basis to assess regional changes in income and employment (building its analysis from the bottom-up rather than using a top-down approach used by EPA). Because EPA did not undertake a Section 308 survey,²³ data were not available to implement such an approach for this rulemaking. The type of study this commenter recommends, however, is even more detailed and would require additional data, requiring that data be collected from all farming operations within a community—both regulated and non-regulated—as well as businesses and other institutions that might be affiliated with those farms. More focused analyses are sometimes conducted by academia to examine very narrowly-defined policy effects within a particular community or U.S. county; these analyses require a more detailed framework and the use of specific data collected from actual businesses in that community, including other farming and non-farming operations in that community. EPA typically does not conduct analyses conducted at this level of detail in developing national level regulations. Data and information were not available to support the more detailed analysis suggested by some commenters. EPA believes that the analysis it conducted using the best data available adequately informed the Agency's decision-making process for this rule. For more information see response to comment DCN CAFO400159-26.

²³ See discussion in the preamble to the 2001 Proposal at 66 FR 3079.

Table 2-10. Market Model Baseline Values (1997)

Variable	Beef ^{a/}	Dairy ^{b/}	Hog	Broiler ^{c/}	Turkey ^{c/}	Layer ^{d/}
Farm Products						
Price	\$66.09/cwt	\$13.38/cwt	\$54.30/cwt	37¢/lb	40¢/lb	70¢/doz.
Quantity Produced	40,893 thous. head	156,100 mil. lbs	91,960 thous. head	--	--	6,473 mil. doz.
Quantity Exported	282 thous. head	0	55 thous. head	--	--	895 mil. doz.
Quantity Imported	2,046 thous. head	0	3,178 thous. head	--	--	0
Retail Products						
Price	\$2.80/lb	145.5	\$2.45/lb	151¢/lb	105¢/lb	106¢/doz.
Quantity Demanded	25,824 mil. lbs	156,100 mil. lbs	17,274 mil. lbs	27,551 mil. lbs	5,412 mil. lbs	5,578 mil. doz.
Quantity Exported	2,136 mil. lbs	5,244 mil. lbs	1,044 mil. lbs.	5,048 mil. lbs	598 mil. lbs	228 mil. doz.
Quantity Imported	2,343 mil. lbs	4,383 mil. lbs	633 mil. lbs	5 mil. lbs	0	7 mil. doz.
Elasticities						
Demand Elasticity	-0.621	-0.247	-0.728	-0.372	-0.535	-0.110
Supply Elasticity	1.020	1.527	0.628	0.200	0.200	0.942

Sources: See USEPA, 2001a.

^{a/}Includes veal and heifer.

^{b/} Consumer Price Index for Dairy Products as a composite good. Output is on a milk equivalent, total solids basis.

^{c/}Includes various forms of chicken meat, such as broilers and mixed poultry meat. Because of coordination between the broiler feeding and processing sectors, it is not possible to determine prices per animal at the farm level. The chicken and turkey markets are modeled in terms of pounds of production.

^{d/}Eggs (million dozen). Layer “exports” represent the number of eggs diverted to hatcheries (assumed as fixed).

Table 2-11. RIMS II Multipliers for Secondary Impact Analysis

Sector Name	Total Output	Total Employment^{a/}	Own Industry Employment^{a/}
Farm Products			
Poultry and Eggs	2.8217	26.3665	12.1043
Meat Animals	2.1692	20.8698	10.2072
Hogs			
Cattle Feeding			
Dairy Farm Products	2.3215	23.5130	11.5267
Food and Kindred Products^{b/}			
Meat Packing Plants	2.4755	18.2332	3.3511
Meat/Egg Processing			
Poultry Processing	2.1822	18.0150	6.1750
Fluid Milk Processing	2.3968	16.3311	2.6981
Dairy Processing			
Other			
Construction	3.0851	32.4816	10.9000
Households	2.1642	23.8483	0.2823

Sources: See USDC, 1997, 1996.

^{a/}Employment multipliers adjusted for inflation to 1997 values based on CPI-U.

^{b/}Processing sector multipliers adjusted to eliminate CAFO level impacts.