Report # _____

REPORT
TASK 1- SURVEY CURRENT LIVESTOCK WASTE MANAGEMENT PRACTICES IN THE SOUTH COAST AIR BASIN

Prepared by

Charles Egigian-Nichols
Tetra Tech, Inc.
3280 East Foothill Boulevard, Suite 350
Pasadena, CA 91107
626.683.0066

Prepared Under Contract #01226 for the

South Coast Air Quality Management District
21865 E. Copley Drive
Diamond Bar, CA 91765
(Contact: Dr. Mary Woods)

January 2002

LIVESTOCK WASTE MANAGEMENT PRACTICES AND CONTROL OPTIONS ASSESSMENT

Task 1 - Report

CONTRACT #01226

TABLE OF CONTENTS

C. APPENDICES

TASK 1

SURVEY CURRENT LIVESTOCK WASTE MANAGEMENT PRACTICES IN THE SOUTH COAST AIR BASIN

A. SUMMARY

Overall Approach- The work in this project builds from an understanding of the interrelationships between livestock agriculture as practiced in the Chino Basin Dairy Area and the atmospheric emissions situation associated with those practices. In order to address the needs of this project and the South Coast Air Quality Management District (District), our team draws on our own extensive local experience and the expertise of researchers being led by the United States Department of Agriculture-Agricultural Research Service National Programs on Manure and Byproduct Utilization and Air Quality.

Background **– Scope of Work** The scope of work for this report includes four tasks. Task 1 surveys the current practices of livestock waste management in the South Coast Air Basin (SCAB). This task brings together information from field research and various databases to summarize the current and recent historical situation with respect to manure management in the region.

Sequence of Activities/ Description of Methodology & Techniques The sequence of activities and methodology for this task began with field work including site visits to typical dairies in the SCAB. Data in the form of manure manifest information was collected from the Santa Ana Regional Water Quality Control Board (SARWQCB) regarding manure management practices. The California Department of Food and Agriculture (CDFA) dairy facility database was obtained and reviewed in comparison to the SARWQCB manifest data. Contacts were made with manure management contractors and compost manufacturers who manage the bulk of the livestock waste in the SCAB. Various local, state, and federal regulations governing livestock waste management practices were obtained and compiled. Information regarding the Organics Management Strategy from the Inland Empire Utilities Agency (IEUA) was obtained and compiled.

Technical Summary of the Science of Dairy Air Emissions Three types of emissions (gases, particulate matter, and aerosols) affect air quality changes around animal operations, manure storage areas, and manure field application sites. Gases of particular interest include ammonia, odorous compounds, and greenhouse gases such as methane, carbon dioxide, and nitrous oxides.

Ammonia emissions appear to have the greatest potential for adverse environmental and health impacts, while generation and transport of malodorous compounds provoke the greatest public concern. Ammonia is the most abundant alkaline component in the atmosphere that neutralizes acid gases of sulfur and nitrogen oxides. Consequently, with large amounts of acid gases from fossil fuel combustion, ammonium is a major component of atmospheric aerosols. Ammonia and ammonium aerosols have different residence times in the atmosphere and may affect ecosystems in many different localities.

For example, localized high concentrations of ammonia can cause health problems, mostly respiratory, in humans and animals. In addition, volatilization of ammonia to the atmosphere can reduce the fertilizer value of manure and impact both local and distant ecosystems. Interaction of

ammonia with other forms of air pollution, such as sulfur dioxide, can result in acid deposition in waterways and directly on plants.

Problem emissions are principally derived from manure and animal byproducts, although feed, bedding, and chemical use can contribute to emissions. Emissions are generally a result of biological activity. Both the rate and type of biological activity, and rates of emissions, are highly dependent on relative concentrations of substrates, availability of catalysts, and environmental conditions such as availability of oxygen, ambient temperature, moisture level, and wind exposure.

Under standard conditions, ammonia is a colorless gas with a pungent odor detectable at 3 to 5 parts per million but easily discernible at concentrations above 50 parts per million. It is ubiquitous in the soil, atmosphere, and waters of the earth with most of the ammonia coming from anthropogenic (human-related) activity. It is highly reactive and remains in the atmosphere only a short time. It reacts quickly with water, forming ammonium. In the air, it can dissolve in precipitation and fall to the earth as ammonium. Because ammonia gas is so reactive, after being released, its concentration is localized because of absorption by plants and/or water and neutralization to aerosols. However, ammonia rarely is depleted in the atmosphere because all plants have a point below which they emit gaseous ammonia; at concentrations above this point (ammonia compensation point), plants will absorb ammonia. Ammonia emissions also potentially cause some nitrous oxide loss into the atmosphere.

In the U.S., the largest potential concentrated sources of ammonia emissions are CAFOs because they often are located in relatively small geographical areas to provide increased efficiency, improved economics, and a better industry support system. This viewpoint succinctly describes the situation in the Chino Basin Dairy Area.

These facilities use waste management systems that release ammonia to the environment. The common calculation of ammonia emissions from domestic animal production is based on an average nitrogen excretion for different categories. However, emissions can be quite different depending on housing types, feedstuffs and nutritional management systems, waste handling methods, application techniques, and type of crops upon which wastes are applied. Data on domestic animal ammonia emissions in the U.S. are limited, and early ammonia emissions inventories were based on European country-specific emissions from animal wastes. Better emissions information is needed from U.S. production systems, which are very different from European conditions, including climatic, management systems, housing, and waste recycling and/or disposal systems. Furthermore, reduction of nitrogen losses is economically significant, providing strong motivation from the animal and crop producer's viewpoint to promote reduction or prevention of these losses.

Ammonia production at CAFOs is a consequence of bacterial activity involving organic nitrogen substrates. The primary source of ammonia production is the conversion of urea for livestock. The process is extremely rapid, requiring only hours for substantial and days for complete conversion to ammonia. A secondary source, which in this time frame can account for up to 35 percent of ammonia production, is organic nitrogen compounds in feces. In total, rapid processes convert about 35 percent of the total organic nitrogen initially in manure to ammonia. Over longer periods, principally during storage, 50 to 70 percent of the organic nitrogen can be converted to ammonia.

The primary source of methane release in livestock production is ruminant animals. Release is a consequence of microbiological activity within the gastrointestinal tract necessary for breakdown of

foodstuffs to compounds available for uptake by animals. Metabolic processes of methanogens can also result in significant methane release at all stages of manure handling. Carbon dioxide is the normal byproduct of animal and bacterial metabolism. Nitrogen dioxide and NOx release are normally the result of nitrification and denitrification processes whereby ammonia is converted to inorganic forms of nitrogen that, in turn, are converted to nitrogen gas. In addition, significant quantities of these gases can be released as by-products of engineering processes designed to dispose of manure or reduce odors. Current research has identified that anaerobic processes generate a wide range of compounds and are responsible for the release of large masses of nitrogen and methane to the atmosphere.

Emission of gases from all phases of manure handling is poorly understood. Ammonia and methane loss into the atmosphere from manure storage is significant and has a negative impact on the environment. However, there is little information on the emission rates of these gases from different farm environments. Likewise, hydrogen sulfide emission rates vary with type of manure system and management activities, e.g., manure handling and application. Knowing the rates of emission is necessary to understand how management practices or alternative manure handling processes could reduce the impact of these emissions on the environment and neighbors. In addition, ammonia losses from manure reduce the value of manure as a fertilizer. Techniques to stabilize ammonia in manure need to be developed. Of particular interest are techniques that result in products that can be profitably transported. Information related to the broad spectrum of existing manure storage practices and facilities is lacking. Results to date show a large variation across time and among types of manure storage and handling systems.

Improvement of air quality can result from changing the emission rate from livestock facilities or manure or through implementation of management practices that increase the dispersion rate of gases and particulate matter into the atmosphere. There are numerous potential solutions to altering the emission rates. For example, diet can directly alter emissions and manure composition; however, it is not clear what effect changes in manure composition will have on emissions. There are methods for manure handling, e.g., liquid- solid separation that could have a large impact on ammonia release and volatile organic compound formation and release. Chemical amendments, such as aluminum sulfate and urease inhibitors, have been shown to reduce ammonia emissions from animal manures; however, the net environmental impact of using these additives is not clear, and the effect of these compounds on emissions of other trace gases is unknown.

Another approach to improving air quality stemming from CAFOs is to develop systems to contain nitrogen compounds within farm boundaries. Nitrogen compounds are imported onto farms through animal feed or fertilizer. This nitrogen is essential for efficient animal and crop production. Life cycle analysis systems approaches are needed to link nitrogen imports tightly to production, thus limiting the potential nitrogen losses to surrounding ecosystems. These approaches need to include entire farm management plans that maximize nitrogen use efficiency and limit excess nitrogen output.

In general with land application of manure, factors such as soil pH, soil moisture content, air temperature, and method of application affect the quantity of ammonia lost to the atmosphere. Method of application probably is the most critical factor. Injection or immediate incorporation of the fertilizer into the soil greatly reduces ammonia volatilization compared to surface applications. Recent studies with swine lagoons in the Southeast indicate that more nitrogen may be lost as environmentally harmless nitrogen gas rather than ammonia. Further, nitrogen conversion needs to be enhanced in many nutritional management and animal nutrient processing and cycling technologies to

reduce the amount of nitrogen lost as liquid and solid wastes. Reducing amino acid content in feed is one example of a technology that reduces ammonia in the waste stream. (Significant portions of this background section were extracted from information available from United States Department of Agriculture (USDA)- Agricultural Research Service (ARS) National Programs on Manure and Byproduct Utilization and Air Quality)

Report Summary This report supplies information from field research and various databases, summarizing the current and recent historical situation with respect to manure management in the region. Information on local, state, and federal regulatory requirements for manure management was collected and reported. The organics management strategy and program of the Inland Empire Utilities Agency was researched and reported. Selected technical data was attached in several appendices to this report.

Report Conclusions The conclusions from this report are noted below.

1. Problem emissions from dairy facilities are principally derived from manure and animal byproducts, although feed, bedding, and chemical use can contribute to emissions. Emissions are generally a result of biological activity. Both the rate and type of biological activity, and rates of emissions, are highly dependent on relative concentrations of substrates, availability of catalysts, and environmental conditions such as availability of oxygen, ambient temperature, moisture level, and wind exposure.
2. Ammonia emissions appear to have the greatest potential for adverse environmental and health impacts, while generation and transport of malodorous compounds provoke the greatest public concern.
3. Ammonia production at CAFOs is a consequence of bacterial activity involving organic nitrogen substrates. The primary source of ammonia production is the conversion of urea for livestock. The process is extremely rapid, requiring only hours for substantial and days for complete conversion to ammonia. A secondary source, which in this time frame can account for up to 35 percent of ammonia production, is organic nitrogen compounds in feces. In total, rapid processes convert about 35 percent of the total organic nitrogen initially in manure to ammonia. Over longer periods, principally during storage, 50 to 70 percent of the organic nitrogen can be converted to ammonia.
4. Emission of gases from all phases of manure handling is poorly understood. Ammonia and methane loss into the atmosphere from manure storage is significant and has a negative impact on the environment. However, there is little information on the emission rates of these gases from different farm environments.
5. The dairy industry in the SCAB appears to be slowly contracting due in part to land use pressures from expanding urbanization. The numbers of operating dairies and related livestock facilities in the SCAB area dropped from a high of 320 in 1996 to 306 in 2000. Reliable data on number of dairies in the SCAB was not available for 1995.
6. The total number of dairy animal units and milking cows in the SCAB appears to be relatively constant over the past five years. Various data sources indicate the number of dairy animal units between 400,000 and 500,000 at any one time. The number of lactating cows, which produce the most manure and related gaseous emissions, appears to trending slightly down to a current level around 275,000.
7. The location of dairies remained constant over the past five years as shown on Figure 15.

8. The total amount of manure produced in the Chino Dairy Area was most recently reported at 1.45 million tons of corral dry material. The average manure production per animal unit equaled 2.9 tons.
9. Only two manure management practices were used by dairies in the SCAB. These practices were land application for fertilizer and soil amendment plus manure composting. About 75% of current manure production was land applied. The remaining 25% was composted.
10. The majority of manure land application occurred in Riverside County on land near Moreno Valley, Perris, Temecula, San Jacinto, and nearby communities. A trend exists of increasing truck transportation to remove manure from the Chino Basin 1 and 2 vicinities consistent with SARWQCB orders that prohibit any new land fertilization with manure.
11. Manure land application technology remains the most economical method available to most dairy operators.
12. The vast majority of manure land application is accomplished by contractors serving the dairy industry. The total number of contractors is about 55. The majority of manure is managed by about 12 firms.
13. Manure composting is performed by 18 firms. The composting technology is exclusively open windrow systems. These firms composted about 356,000 tons of manure during 2000.
14. The Santa Ana Regional Water Quality Control Board exerts the most regulatory over dairy manure management activities. The Board manages compliance with the Clean Water Act and Porter-Cologne Act. None of these regulations directly addresses air emissions from dairy CAFO systems.
15. The USDA-NRCS administers manure management guidelines and practices as a technical advisor to the dairy industry. These guidelines have minimal application to emissions from CAFOs.
16. The US EPA is in the midst of developing new regulations applicable to water quality and environmental protection at CAFOs. The effect of these proposed regulations in relation to air quality in the SCAB is difficult to estimate. This difficulty is due in part to the lack of certainty about the final regulation. Additionally, the proposed regulation focuses only on water resources and not air quality issues. The proposed regulation stimulated significant public comment from industry and environmental sources. This comment caused the EPA to extend the comment period. Many commentators found the proposed regulation controversial.
17. As best as can be estimated at this time, the US EPA regulatory proposals would have no immediate, direct effect on air quality. The proposed regulation could cause dairy operators to increase the amount of manure trucked away from the SCAB. In this case, transportation emissions could increase. In other circumstances, the proposed regulation could cause dairy operators to increase the amount of manure processed in local anaerobic digestion and composting facilities, which could have the effect of reducing ammonia and VOC emissions. A third possible impact of the proposed regulation is that the cost of dairy operations could rise to the point that a number of dairies in the SCAB would find it uneconomical to continue in operation and could be forced out of the area or out of business. This could result in reduced ammonia and VOC emissions.
18. IEUA has completed a comprehensive strategy for implementing a coordinated, cost-effective approach to managing organics in phased incremental manner consistent with sound public works engineering principles. Based upon the recommended Business Plan strategy, IEUA will increase digester gas production at Regional Plant (RP)-1, RP-2, RP-4, and RP-5; develop enclosed composting facilities that are less expensive and more reliable long-term solutions than trucking biosolids and manure to San Joaquin Valley, Arizona, or Nevada; and develop local “self-sufficient” organic recycling projects in enclosed facilities.

B. TASK 1 – SURVEY CURRENT LIVESTOCK WASTE MANAGEMENT PRACTICES IN THE SOUTH COAST AIR BASIN

Waste Management Practices- This portion of Task 1 identifies and quantifies waste management practices in the South Coast Air Basin including information gathered from field surveys and analysis of various databases reporting on dairy manure management.

SARWQCB Manure Manifest Database. The Santa Ana Regional Water Quality Control Board collects manure management information from each operating dairy in the SCAB. This information was supplied by the SARWQCB in the form of spreadsheets and a database for the years 1997, 1998, 1999, and 2000.

Figures 1 through 15, at the end of this section, supply graphical information summarizing statistical information about the dairies in the SCAB over the period 1997 through 2000. This information was derived from the data reported by dairies to the SARWQCB through the Annual Report of Animal Waste Discharge, the Manure Tracking Manifest and data reported to the California Department of Food and Agriculture (CDFA).

Analysis of the manifest data shows that during 2000, SCAB dairies reported 700 manure removal events. For the 305 dairy facilities reporting in 2000, manure removal events averaged 2.3 per dairy. This value is consistent with the requirement by the SARWQCB that manure be removed from the dairy at least once every 6-months.

Analysis of the data shows that only two-manure management practices, land application and composting, are being used by dairies in the SCAB. The vast majority, 75% or more, of manure is land applied as a fertilizer and soil amendment for crops of various types. The remainder, 25%, is composted in open windrow systems. Overall, the amount of manure reportedly produced in the SCAB averaged 1.3 million tons (corral dry at about 60% solids by weight).

During 2000, the vast majority of the land applied manure was trucked to Riverside County, in particular the vicinity of Moreno Valley, Perris, Temecula, San Jacinto, and nearby communities. Other locations receiving manure included Thermal, Riverside, Redlands, Blythe, Kern County, Fresno County, and numerous farms near Chino and Ontario. The land application of manure in these locations is a trend of increasing truck transportation to remove manure from the Chino Basin 1 and 2 vicinities consistent with SARWQCB orders that prohibit any new land fertilization with manure.

CDFA Dairy Database. The CDFA manages a variety of information regarding dairies throughout California. This information is useful as a crosscheck comparing the dairies identified in the SARWQCB manure manifest database to the dairies documented by CDFA. Information on the numbers of cows, dairies, and cows per dairy for the San Bernardino and Riverside County areas were obtained from the Dairy Marketing Branch.

Dairies in SCAB. The number of dairies reportedly in the SCAB increased from 271 in 1997 to 305 in 2000. Trends for numbers of milking cows, dry cows, heifers, calves, and total animal units has mirrored this trend. The location of dairies in the SCAB is shown in Figure 15.

During 2000, a total of 1,448,634 tons of manure (corral dry at about 60% solids by weight) was removed from these dairies. This amount of manure is a slight increase over previous years. This increase is consistent with increases in the number of animal units in the SCAB. The average manure production per dairy remained nearly constant at about 4,540 tons per year. The manure production per animal unit varied somewhat over the past 4-years from a high of 3.5 tons (corral dry at about 60% solids by weight) to a low of 2.7 tons per animal unit. The 2000 production was reported at 2.9 tons per animal unit.

Manure Management Contractors in SCAB. The number, practices, and trends of the manure management contractors operating in the SCAB was determined through analysis of the SARWQCB databases, contacts with manure management contractors, and contacts with the Milk Producers Council. The most recent data shows a total of 55 contractors or firms registered that removed manure from dairies in the SCAB. Of this total, a dozen firms managed the majority of manure movement. The remaining firms removed only small quantities of manure on an occasional basis.

Manure Management Compost Manufacturers. The number, practices, and trends of the manure compost manufacturers operating in the SCAB was determined through analysis of the SARWQCB databases, contacts with manure compost manufacturers, and contacts with the Milk Producers Council. The most recent data shows a total of 18 contractors or firms registered with the SARWQCB that received manure from dairies in the SCAB. During 2000, these firms received a total of 356,485 tons of manure (corral dry at about 60% solids by weight). A comparison to previous year data is difficult and unrealistic due to significant differences in reporting requirements for the manifest data for earlier years.

Waste Management Regulatory Requirements- This portion of Task 1 identifies the regulatory requirements per SARWQCB, CDFA, USDA, US EPA, and others targeting dairy waste management practices.

SARWQCB Regulatory Requirements Applicable to SCAB Dairies. The SARWQCB adopted Order No. 99-11 and Cease and Desist Order No. 99-65 relating to CAFOs in the Santa Ana River Watershed. Order No. 99-11 establishes the general waste discharge requirements for CAFOs in the Santa Ana region in compliance with the federal Clean Water Act, the California Porter-Cologne Act, and other regulations. The SARWQCB orders are supplied in Appendix 1.

The SARWQCB orders require a variety of actions by dairies and manure managers. The categories of actions include:

- Permits
- Site plans and designs
- Engineered waste management plans
- Water, wastewater and manure control facilities
- Operational practices
- Monitoring program
- Information reporting

Information reporting is managed through the Annual Report of Animal Waste Discharge and the Manure Tracking Manifest. These forms allow the SARWQCB to compile a comprehensive list of

dairies and manure management practices for the Santa Ana River area. This information was utilized in reporting the status of manure management in the SCAB.

USDA-NRCS Manure Management Guidelines & Practices. The United States Department of Agriculture Natural Resources Conservation Service (NRCS) administers several programs relevant to dairy manure management. NRCS offers dairies technical assistance for a variety of activities including manure management. This technical assistance is not regulatory in nature but is intended to assist the dairy operator achieve compliance with the various local, state, and federal laws, regulations, and ordinances that apply to their operations.

The NRCS administers a nutrient management program in support of confined animal feeding operations (CAFOs). This program implements the NRCS federal conservation programs that derive from various congressional farm bills.

USDA's goal is for animal feeding operation (AFO) owners/operators to take voluntary actions to minimize potential water pollutants from confinement facilities and land application of manure and organic by-products. To accomplish this goal, it is a national expectation that all AFOs should develop and implement technically sound, economically feasible, and site-specific Comprehensive Nutrient Management Plans (CNMP)

In general terms, a CNMP identifies management and conservation actions that will be followed to meet clearly defined soil and water conservation goals, including nutrient management, at an agricultural operation. Defining soil and water conservation goals and identifying measures and schedules for attaining the goals are critical to reducing threats to water quality and public health from AFOs. The CNMP should fit within the total resource management objectives of the entire farm/animal feeding operation.

A CNMP is a conservation system that is unique to animal feeding operations. A CNMP is a grouping of conservation practices and management activities which, when implemented as part of a conservation system, will help to ensure that both production and natural resource protection goals are achieved. It incorporates practices to utilize animal manure and organic by-products as a beneficial resource. A CNMP addresses natural resource concerns dealing with soil erosion, manure, and organic by-products and their potential impacts on water quality, that may derive from a animal feeding operation. A CNMP is developed to assist an AFO owner/operator in meeting all applicable local, tribal, State, and Federal water quality goals or regulations. For nutrient impaired stream segments or water bodies, additional management activities or conservation practices may be required by local, tribal, State, or Federal water quality goals or regulations.

The conservation practices and management activities planned and implemented as part of a CNMP must meet NRCS technical standards. For those components included in a CNMP where NRCS does not currently maintain technical standards (i.e., feed management, vector control, air quality, etc.), producers must meet criteria established by Land Grant Universities, Industry, or other technically qualified entities. Within each state, the NRCS State Conservationist has the authority to approve non—NRCS criteria established for use in the planning and implementation of CNMP components.

One program offered by the NRCS is a series of Conservation Practice Standards within the Nutrient Management Policy & Technical Guidance. This information is targeted at waste management,

nutrient management, and environmental protection. These Practice Standards include the list in Table 1.

TABLE 1- LIST OF RELEVANT NRCS CONSERVATION PRACTICE STANDARDS

Name of Practice Standard	#
Waste Management System	312
Waste Storage Facility	313
Composting Facility	317
Waste Treatment Lagoon	359
Closure of Waste Impoundments	360
Nutrient Management (revised April 1999)	590
Waste Utilization (revised April 1999)	633
Manure Transfer	634

Additionally, NRCS offers the **Agricultural Waste Management Field Handbook**. This handbook provides technical guidance on all aspects of planning, design, and implementation of agricultural waste management systems, including production, collection, storage, treatment, and utilization of manure and other agricultural residuals. The reference is considered the “bible” of waste management facility design.

The NRCS has worked jointly with the US EPA to develop the Unified National Strategy for Animal Feeding Operations, available at http://www.epa.gov/owm/finafost.htm. The NRCS website regarding animal feeding operations is available at http://www.nhq.nrcs.usda.gov/PROGRAMS/ahcwpd/AFO.html. This strategy presents USDA and EPA's plan for addressing the water quality and public health impacts associated with AFOs. USDA and EPA issued a draft of this Strategy on September 16, 1998, and requested public comment during a 120-day period. In addition, 11 national "listening sessions" were held throughout the U.S. to discuss the draft Strategy and hear public feedback. The final Strategy reflects written comments received as well as issues raised during the listening sessions. USDA and EPA appreciate the public feedback on the draft Strategy and will continue to seek public involvement in implementing the activities described in the final Strategy.

This Strategy is not a new regulation nor is it a substitute for existing Federal regulations and it does not impose any binding requirements on USDA, EPA, the States, Tribes, localities, or the regulated community. USDA and EPA's policies for addressing AFOs may evolve and change as their understanding of the issues increases through further work and receipt of additional information.

This USDA-EPA Unified National Strategy for Animal Feeding Operations reflects several guiding principles:

1. Minimize water quality and public health impacts from AFOs.
2. Focus on AFOs that represent the greatest risks to the environment and public health.
3. Ensure that measures to protect the environment and public health complement the long-term sustainability of livestock production in the United States.
4. Establish a national goal and environmental performance expectation for all AFOs.
5. Promote, support, and provide incentives for the use of sustainable agricultural practices and systems.

6. Build on the strengths of USDA, EPA, State and Tribal agencies, and other partners and make appropriate use of diverse tools including voluntary, regulatory, and incentive-based approaches.
7. Foster public confidence that AFOs are meeting their performance expectations and that USDA, EPA, local governments, States, and Tribes are ensuring the protection of water quality and public health.
8. Coordinate activities among the USDA, EPA, and related State and Tribal agencies and other organizations that influence the management and operation of AFOs.
9. Focus technical and financial assistance to support AFOs in meeting the national goal and performance expectation established in this Strategy.

CDFA-Milk & Dairy Foods Control Branch. The Milk and Dairy Foods Control Branch (MDFC) is an office within the California Department of Food and Agriculture. MDFC inspects dairies for general sanitation, appropriateness of facilities, and overall health of animals. The focus of MDFC is the health and safety of milk and milk products from production to consumption. The MDFC is the only state agency that routinely that provides this level oversight.

The MDFC ensures that milk, milk products, and products resembling milk products are safe and wholesome, meet state and federal compositional requirements, and are properly labeled. MDFC certifies dairy farms, milk plants and sources of single-service dairy containers for the United States Food and Drug Administration (US FDA) interstate sales and for use by milk processors selling products to federal entities. MDFC inspects manufacturing grade dairy farms and milk processing plants and provide product grading service for the US FDA. MDFC inspectors sample raw milk at the milk production facility every six months. If a dairy is out of compliance with MDFC health standards, a citation can be issued.

US Food & Drug Administration Requirements. The United States Food and Drug Administration (FDA) {http://www.fda.gov/} is an agency within the Public Health Service, which in turn is a part of the Department of Health and Human Services. FDA is an operating division of the U.S. Public Health Service (PHS). The FDA assists the MDFC investigating special health related cases associated with milk production. The agency does not have any specific regulations pertaining to manure waste management on dairy facilities.

US EPA Confined Animal Feeding Operations (CAFO) Draft Regulation. The US EPA is in the midst of developing new regulations applicable to CAFOs. EPA is expected to take final action on this regulation by December 15, 2002 in compliance with a consent decree reached with the Natural Resources Defense Council. EPA proposes to revise and update two regulations that address the impacts of manure, wastewater, and other process waters generated by concentrated animal feeding operations (CAFOs) on water quality. These two regulations are the National Pollutant Discharge Elimination System (NPDES) provisions that define which operations are CAFOs and establish permit requirements, and the Effluent Limitations Guidelines for feedlots (beef, dairy, swine and poultry subcategories). The regulations establish the technology-based effluent discharge standards for CAFOs. EPA is proposing revisions to these regulations to address changes that have occurred in the animal industry sectors over the last 25 years, to clarify and improve implementation of CAFO permit requirements, and to improve the environmental protection achieved under these rules. The draft rule is available at http://www.epa.gov/sbrefa/documents/pnl19n.pdf or http://www.epa.gov/reg3wapd/pretreatment/pdfs_txt/cafo1.txt

Environmental concerns being addressed by this rule include both ecological and human health effects associated with water systems. Manure from stockpiles, lagoons, or excessive land application can reach waterways through runoff, erosion, spills, or via groundwater. These discharges can result in excessive nutrients (nitrogen, phosphorus, and potassium), oxygen-depleting substances, and other pollutants in the water. This pollution can kill fish and shellfish, cause excess algae growth, harm marine mammals, and contaminate drinking water.

The existing regulation defines facilities with 1,000 animal units ("AU") or more as CAFOs. The regulation also states that facilities with 300 -1000 AU are CAFOs if they meet certain conditions. The term AU is a measurement established in the 1970 regulations that attempted to equalize the characteristics of the wastes among different animal types.

EPA proposed two alternatives for how to structure the revised NPDES program for CAFOs. The first alternative is a "two-tier structure" that simplifies the definition of CAFOs by establishing a single threshold for each animal sector. This alternative would establish a single threshold at the equivalent of 500 AU, above which operations would be defined as CAFOs and below which facilities would become CAFOs only if designated by the permit authority. The 500 AU equivalent for dairies is 350 mature dairy cattle (whether milked or dry).

The second proposal would retain the "three-tier structure" of the existing regulation. Under this alternative, all operations with 1,000 AU or more would be defined as CAFOs; those with 300 AU to 1,000 AU would be CAFOs only if they meet certain conditions or if designated by the permit authority; and those with fewer than 300 AU would only be CAFOs if designated by the permit authority. Dairy cows are the benchmark for animal units in this proposal, meaning that one dairy cow equals one animal unit.

The effect of these proposed regulations in relation to air quality in the SCAB is difficult to estimate. This difficulty is due in part to the lack of certainty about the final regulation. Additionally, the proposed regulation focuses only on water resources and not air quality issues. The proposed regulation stimulated significant public comment from industry and environmental sources. This comment caused the EPA to extend the comment period. Many commentators found the proposed regulation controversial.

Compliance assurance of the CAFO regulations by EPA and other agencies is considered a high priority. EPA's implementation plan to assure compliance is available at http://es.epa.gov/oeca/strategy.html . The Office of Enforcement and Compliance Assurance (OECA) is making implementation of the existing CAFO regulations a priority. This is an essential component of the Agency's overall effort to reduce public health and environmental impacts from AFOs. A strong compliance/enforcement program will foster compliance and serve to prevent the major spills and reduce pollution from livestock production. This CAFO Compliance Assurance Implementation Plan provides for:

- An active risk-based compliance monitoring program to assure CAFO compliance with the existing National Pollutant Discharge Elimination System (NPDES) requirements. An enhanced Federal/State field presence (i.e., inspections and compliance assistance activities) will foster compliance, as will enforcement actions when violations are found. (See Neutral Administrative Inspection Scheme criteria under "Inspections".)
- Coordination with States and other Federal Agencies.

- Coordination with stakeholders to identify and provide compliance assistance information.
- Increased compliance assistance to CAFOs to provide better information, including efforts by the EPA's Agriculture Compliance Assistance Center to this segment of the agriculture sector.
- Development of State specific compliance and enforcement strategies[1] which takes into account existing State programs and State and Federal priorities using risk-based targeting. These strategies will serve to create a more consistent national program providing a "level playing field".
- Feedback from inspections which can be used for improvements in targeting compliance assistance, inspections, and permitting activities and, in those cases where the facility is not a designated CAFO but should be, assessing the need to designate an AFO as a CAFO.

As best as can be estimated at this time, the regulatory proposals would have no immediate direct effect on air quality. The proposed regulation could cause dairy operators to increase the amount of manure trucked away from the SCAB. In this case, transportation emissions could increase. In other circumstances, the proposed regulation could cause dairy operators to increase the amount of manure processed in local anaerobic digestion and composting facilities, which could have the effect of reducing ammonia and VOC emissions. A third possible impact of the proposed regulation is that the cost of dairy operations could rise to the point that a number of dairies in the SCAB would find it uneconomical to continue in operation and could be forced out of the area or out of business. This could result in reduced ammonia and VOC emissions.

Organic Management Strategy and Program of the Inland Empire Utilities Agency- This portion of Task 1 identifies the organic management strategy and program of the Inland Empire Utilities Agency.

IEUA Organics Management Strategy, Program & Business Plan. The IEUA has completed a comprehensive strategy for implementing a coordinated, cost-effective approach to managing organics in phased incremental manner consistent with sound public works engineering principles. The plan is documented in its Final Business Plan. A copy of the final Business Plan and all the background technical memoranda, fact sheets and other publications published for the Organics Management Strategy studies and workshops can be found on IEUA's web page: www.ieua.org or copies can requested from Gary Hackney at the IEUA administrative offices in Fontana (909-357-0241).

The key policy objectives are:

- Produce through anaerobic digestion produce enough methane gas for 50 megawatts of clean, renewable electric energy by 2006;
- Cost-effectively recycle organic wastes into fertilizer products in environmentally safe enclosed facilities for local use as a first priority;
- Reduce local air and water pollution;
- Implement strategies that minimize diesel truck trips; and
- Accomplish the above goals in a manner that does not financially impact the Regional Sewage Program.

Based upon the recommended Business Plan strategy, the consultant team and IEUA staff forecast a net savings (estimated at over $1 per EDU, per month) to the Regional Sewage Program through:

- Increased Digester gas production at Regional Plant (RP)-1, RP-2, RP-4, and RP-5;
- Enclosed composting facilities are less expensive and more reliable long-term solutions than trucking biosolids to San Joaquin Valley or other (Arizona, Nevada) options.

The strategic policy recommendations in the Final Business Plan are to implement the Organics Management Strategy consistent with the Chino Basin Watermaster Optimum Basin Master Plan (OBMP), IEUA's Seven Point Emergency Energy Action Plan, and the IEUA adopted Salinity Policy. IEUA staff will continue to utilize "First Thursday" technical workshops to promote interagency coordination and peer review of the implementation of the pilot demonstration projects and the updates of the overall Organics Management Strategy. Finally, the Final Business Plan recommends that IEUA participate in SCAP workshops on September 12, 2001 and spring of 2002. The Business Plan further suggests that IEUA continue to seek regional collaboration on biosolids, dairy cow manure, green material, and food waste partnerships; such that the beneficial reuse of all organic material generated locally through energy (biogas) and fertilizer products be maximized.

As indicated above, the Final Business Plan also recommends the implementation of a comprehensive energy reliability program. The goal is to generate 50 megawatts (MW) by 2006, with local methane gas (biogas) integrated with other renewable energy supplies (e.g., wind, photovoltaic technology). By 2002, 2.0 megawatts of new electrical generation fueled from biogas will be generated through the pilot demonstration projects. These pilot projects include a digester project at Regional Plant No. 1 (RP-1) to use "wet manure" to generate additional biogas (0.25 MW), and dairy digester projects near RP-5 to provide biogas for the Chino I Desalter (1.75 MW).

The goal is to develop local "self-sufficient" organic recycling projects in enclosed facilities sited at or near RP-1, 4 and 5 to reduce truck hauling of organic material. High quality organic fertilizer products will be produced that may be used both within and outside of the Agency service area. A preference will be to maximize use locally for the benefit of the regional contracting agencies.

A small, enclosed composting pilot facility will be constructed at RP-1 to demonstrate that an aerated static pile composting facility in an enclosed structure with a biofilter can cost-effectively produce high quality products. This facility will be fully enclosed with a surface area of approximately 40,000-sq. ft. and will process about 10,000 tons per year of biosolids and dairy manure. Two 30,000 tons per year fully enclosed facilities will be constructed at RP-4 and near RP-5 at the California Institute for Men site in Chino. These two facilities will be initially sized for 30,000 tons per year (wet basis) with the possibility to be expanded to process larger volumes of material in the future. The total of 70,000 tons per year of capacity would meet the needs for biosolids composting from IEUA water recycling plants.

The specific recommendations are summarized below:

Strategic Policy Recommendations

- Implement the Business Plan Organics Management Concepts consistent with the Chino Basin Watermaster OBMP, IEUA's Seven Point Emergency Energy Action Plan and Salinity Policy.
- Incorporate NWRI Workshop recommendations (10 priority areas), and continue to utilize "First Thursday" workshops to promote interagency coordination and from technical peer review panels to provide oversight of the implementation of the pilot demonstration projects.

- Participate in SCAP workshops on September 12, 2001, on regional organics management issues and problems and continue to seek regional collaboration on biosolids, dairy cow manure, green material, and food waste partnerships.
- Maximize the beneficial reuse of all organic material generated locally into energy (biogas) and fertilizer products in a manner that reduces diesel truck trips, air and water pollution.

Comprehensive Energy Reliability Program Recommendations

- Implement an RP-1 Digester Pilot Project to use "wet manure" to generate additional biogas (0.25 MW).
- Implement a Dairy Digester Projects on the Teunissen and Douma properties near the Chino Desalter to provide biogas fuel to microturbines and internal combustion engines at the Desalter (1.75 MW).
- Install anaerobic digesters at RP-4 and RP- 5 (with a target generation capacity of 3.5 MW).

Composting of Organics Residuals and Local Recycling Recommendation

Develop local "self-sufficient" organic recycling projects.

- Maximize use of existing Co-Composting Facility to recycle and market biosolids and manure.
- Build a pilot demonstration enclosed composting facility at RP-1 to test aerated static pile with biofilters to ensure that odors and dust emissions are eliminated. The pilot facility would be about 40,000 square feet inside and process about 10,000 tons per year.
- Locate at RP-4 and near RP-5 (the California Institute for Men site) two 30,000 tons per year fully enclosed facilities. These two facilities would be initially sized to 30,000 tons per year with the possibility to be expanded to process large volumes of material.

Relationship to Ammonia & VOC Emission Reduction Potential. Within the service area of the Inland Empire Utilities Agency, there is an agricultural preserve encompassing primarily dairy farms with currently over 300,000 milking cows; including other livestock in the area there is approximately 350,000 total animals mostly related to the dairy industry. The manure generated from these animals presents a variety of problems related to air quality including emissions of ammonia, volatile organic compounds (VOCs), odors, and dust. In addition to the air quality concerns, there are related water quality problems due to the percolation of salts and nitrogen into the groundwater basins and contamination of the Santa Ana River through stormwater runoff.

To address these concerns, the Agency has developed an Organics Management Strategy that is being implemented in steps consistent with its mission to protect public health, the groundwater basin, and the environment. Quantifying and mitigating air emissions related to the organics in the Agency's service area is a strategic part of the plan.

Using information developed by the SCAQMD and numerous publications from the Environmental Protection Agency (EPA), environmental groups, and the dairy industry, quantitative estimates have been made relating directly to the organics contained in the Agency's service area. The SCAQMD has estimated that the ammonia emissions in the Chino dairy area are approximately 8.6 tons per day and VOCs are 11.1 tons per day. By comparison, the ammonia emissions in the entire basin have been estimated at 184 tons per day and the total livestock ammonia emissions at 56 tons per day. In the production of manure, ammonia and nitrogen gases are flashed rapidly into the atmosphere.

However, IEUA believes the ammonia in the manure can be removed from the area through an efficient organic management system, and it is possible to capture as much as 50% of the ammonia produced. Similarly, VOC reductions would be reduced in the collection and disposal of the manure.

At IEUA facilities, biosolids from the collected wastewater currently amount to approximately 64,000 tons per year. Hydrogen sulfide from the biosolids collection and treatment at IEUA is handled through air cleansing systems (odor scrubbers) while digester gas (methane) produced in the anaerobic digester is either used for power generation or destructed thermally in waste gas flares. Treated biosolids can be combined with other amendments for composting and composted material can be trucked offsite and sold. The emissions from aerated static pile composting will be contained in enclosures and treated through air scrubbing facilities to mitigate sources of odor, dust, and other off gases. Emissions from engines used in generating power and vehicles for hauling materials can be reduced using catalytic converters, other gas scrubbing devices currently in practice, and using higher quality diesel fuels.

The Organics Management Strategy developed by the Agency examined existing and new technologies to meet the goals of reducing the mass amount of biosolids by at least 50%, while containing air emissions and maximizing energy recovery from manure and biosolids. Working with SCAQMD, ammonia reduction in the basin from the dairy area is targeted at 4.3 tons per day (1,600 tons per year) and the VOC reductions are targeted at 3.3 tons per day (1,204 tons per year). This is a reduction in the dairy area of approximately 50% of ammonia and 29.7% of VOC emissions currently estimated for the service area. IEUA and SCAQMD have agreed to cooperate in these studies and establish a value for emissions reduction. Pilot studies are currently underway to document more precisely the reduced air emissions and to generate the basis for opportunities for additional reductions and benefits through the EPA's emissions trading policy and the SCAQMD new source rule. It is anticipated that quantified emission reductions will be used as credits with both economic and environmental benefits.

Strategies identified by the Agency for quantifying and reducing air emissions through improved digestion, composting, and organics management practices will have an immediate and long-term benefit throughout the service area. Emissions that will be reduced including volatile organic carbons, particulate matter, and ammonia resulting from organics and ammonia and global warming gases from manure management. Of the estimated 7,600 tons per year of total emissions, approximately 2,800 tons per year are targeted for elimination through the organics management strategy. An overall decrease of 37% of the current air emissions will have both environmental and economic benefits to the Agency, it's supporting members, and the residents and businesses in the area. As the program progresses and the emission reduction is clearly defined, the opportunity for emission trading and offsets can be realized.

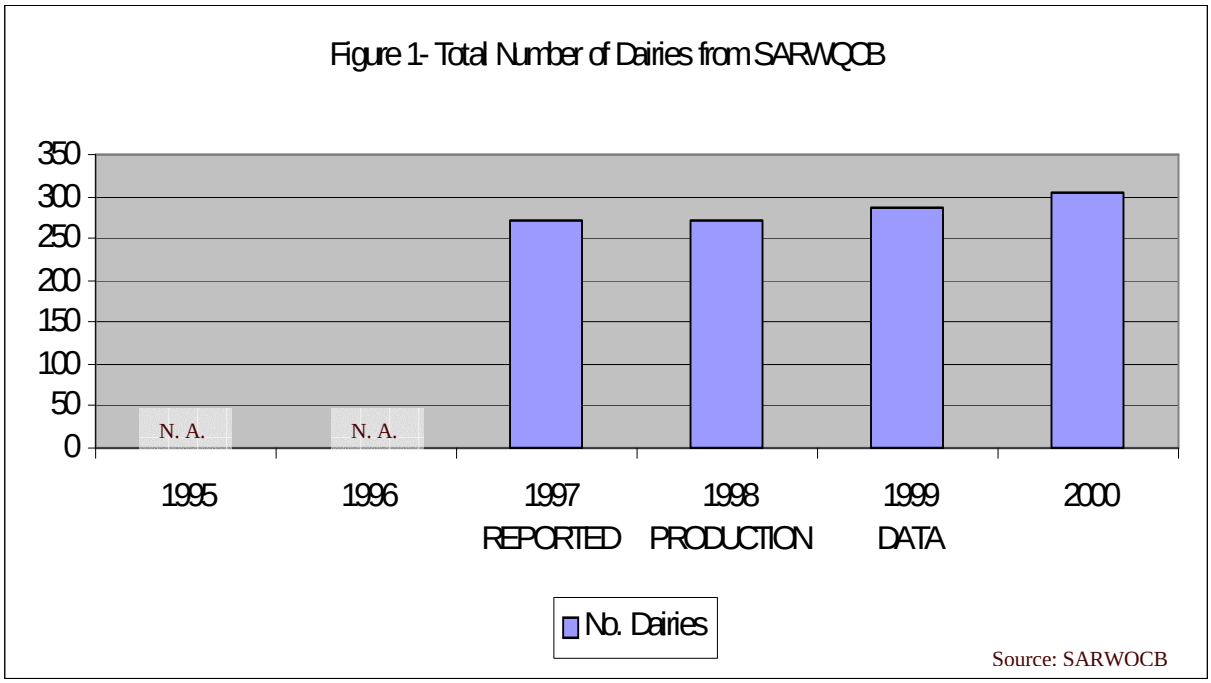


Figure 1- Total Number of Dairies from SARWQCB
350
300
250
200
150
100
50
0
N. A.
N. A.
1995
1996
1997
1998
1999
2000
REPORTED
PRODUCTION
DATA
No. Dairies
Source: SARWOCB

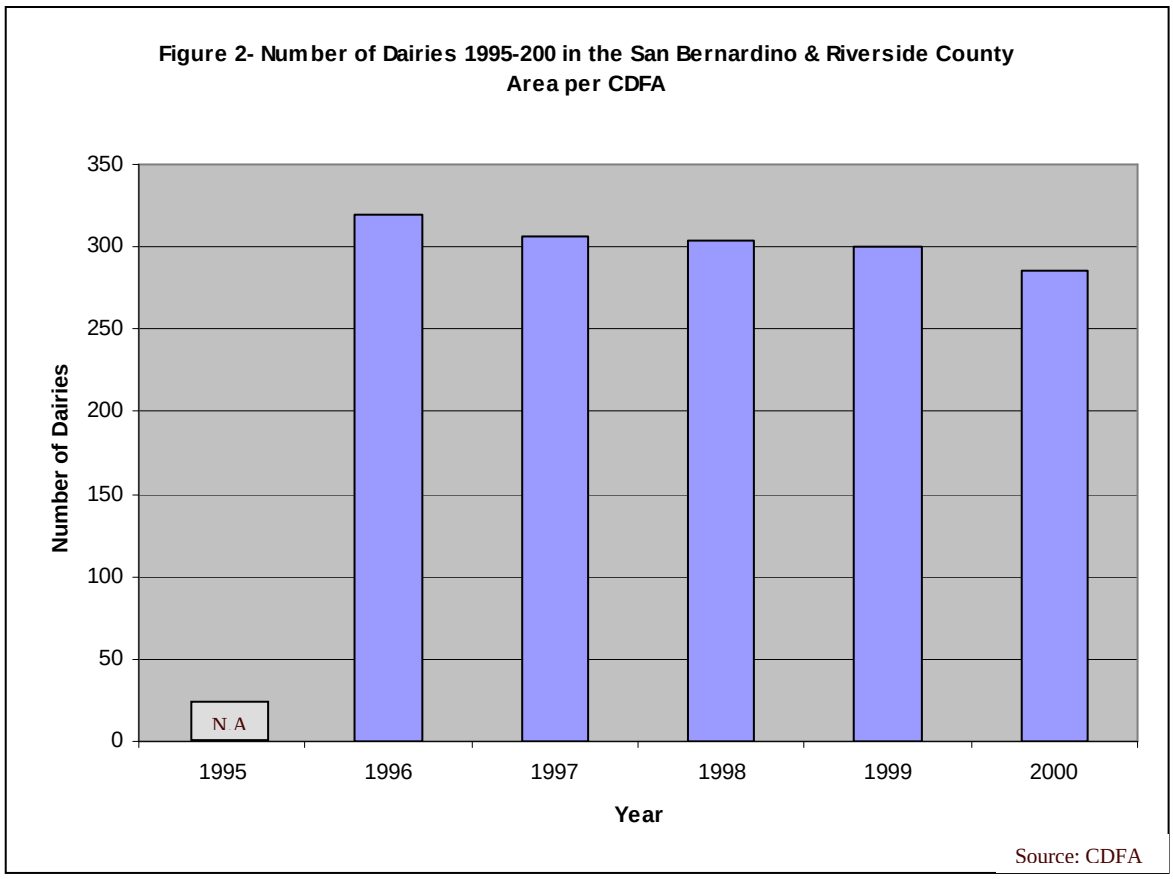
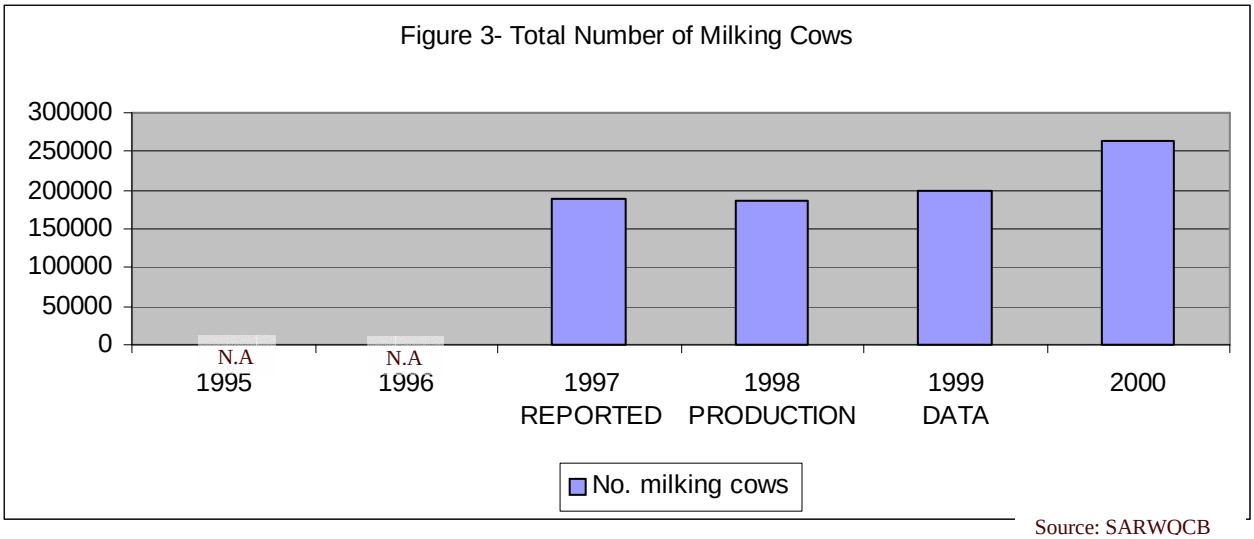
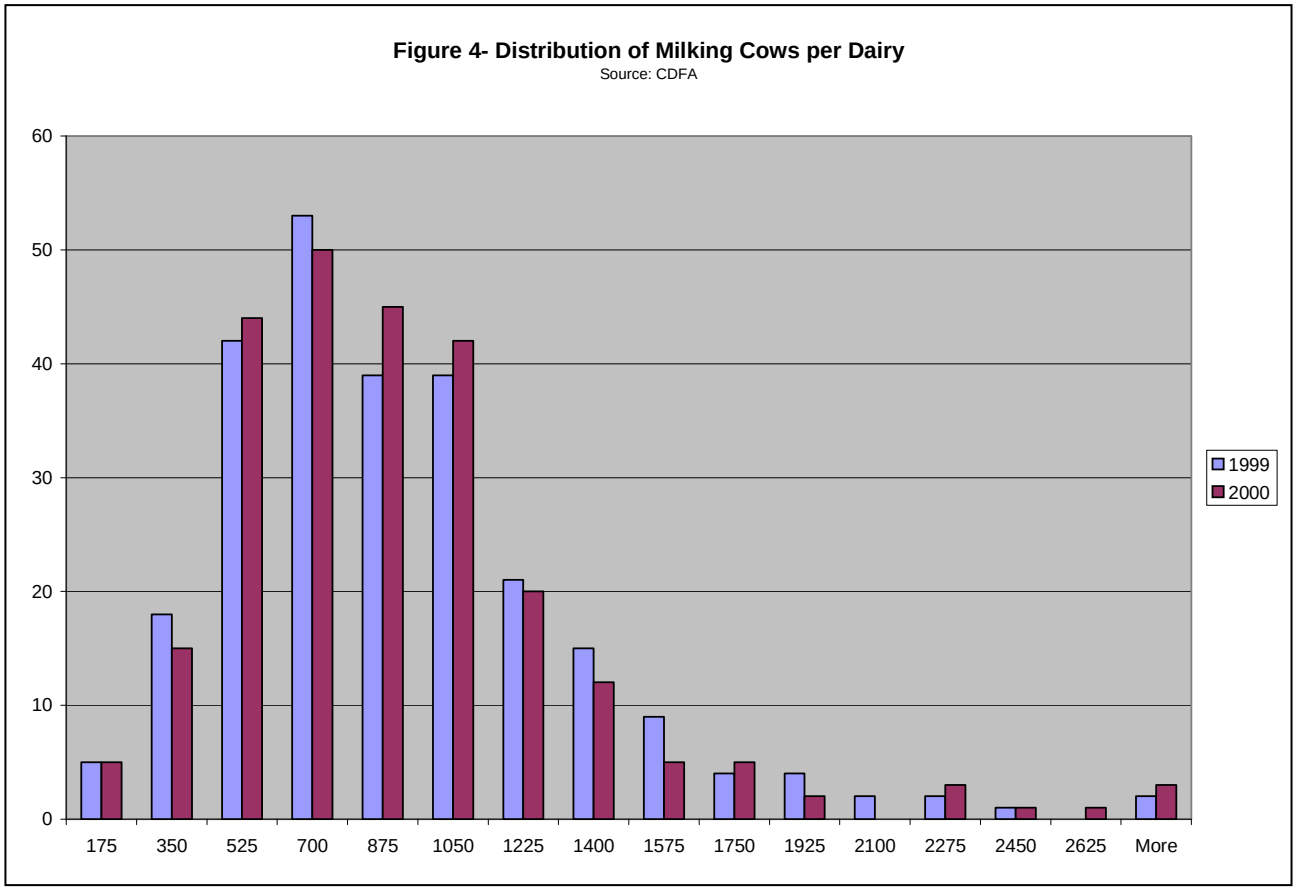


Figure 2- Number of Dairies 1995-200 in the San Bernardino & Riverside County Area per CDFA
Number of Dairies
350
300
250
200
150
100
50
0
N A
1995
1996
1997
1998
1999
2000
Year
Source: CDFA



Source: SARWQCB



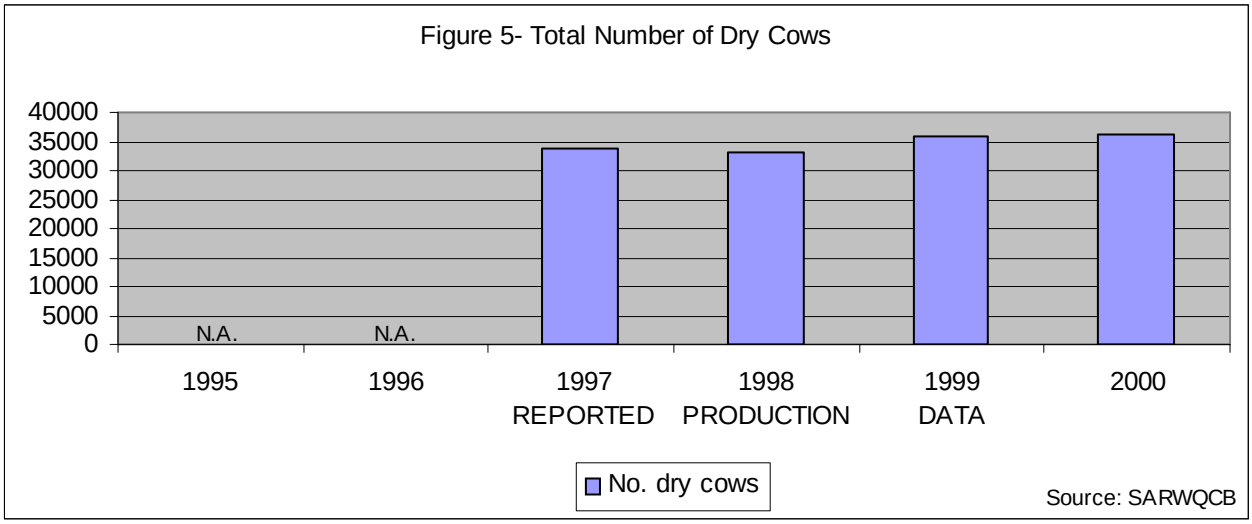


Figure 5- Total Number of Dry Cows
40000
35000
30000
25000
20000
15000
10000
5000
0
N.A.
N.A.
1995
1996
1997 REPORTED
1998 PRODUCTION
1999 DATA
2000
No. dry cows
Source: SARWQCB

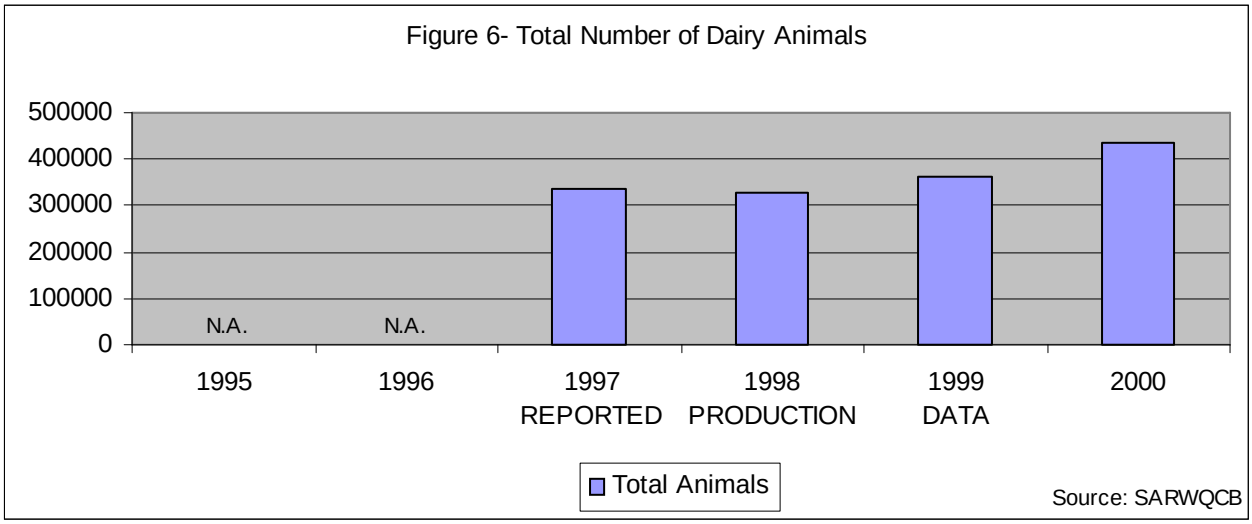


Figure 6- Total Number of Dairy Animals
500000
400000
300000
200000
100000
0
N.A.
N.A.
1995
1996
1997 REPORTED
1998 PRODUCTION
1999 DATA
2000
Total Animals
Source: SARWQCB

Figure 7- Number of Cows 1995-2000 in the San Bernardino & Riverside County Area

Source: CDFA (data reports lactating cows, dry cows, & heifers- does not include calves)

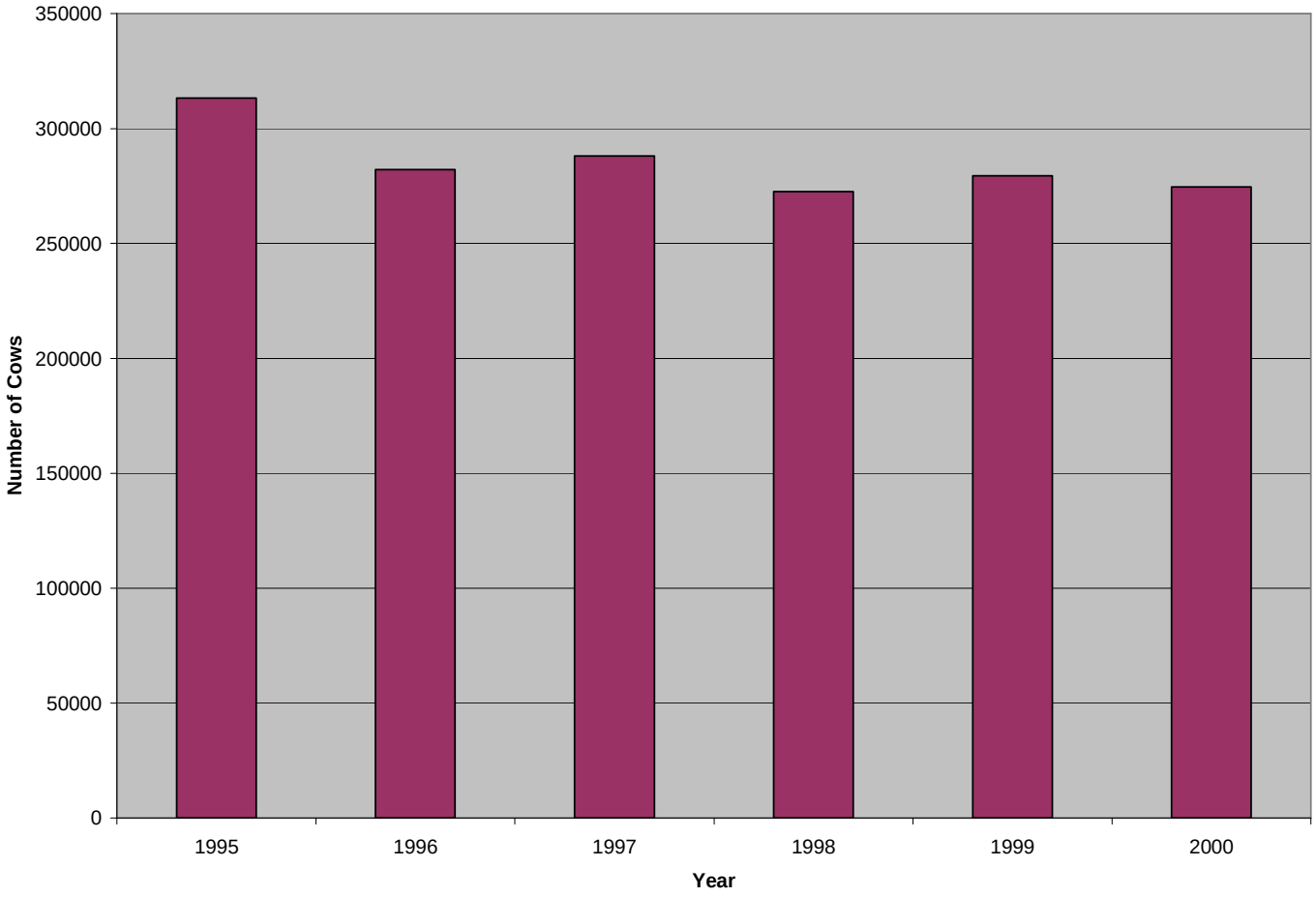
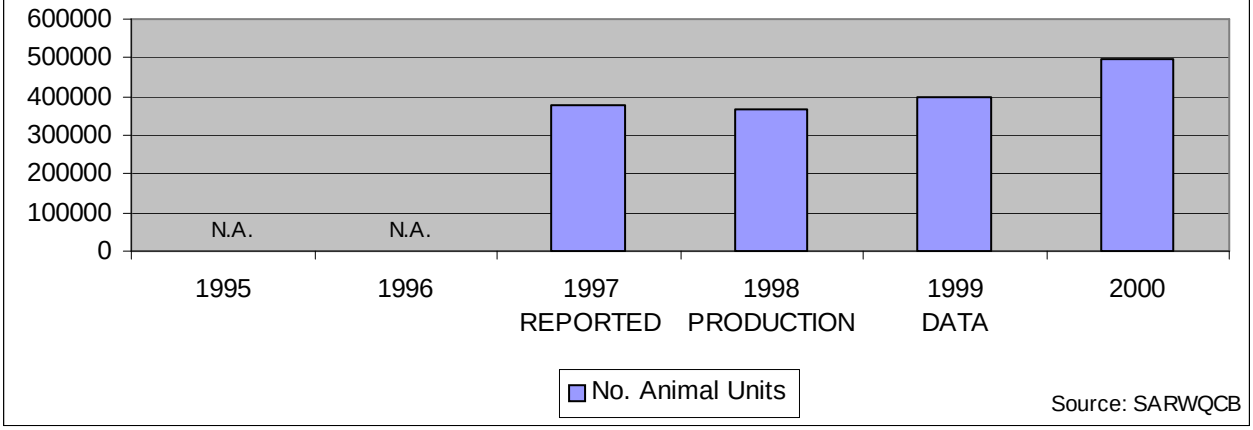


Figure 8- Total Number of Animal Units



Source: SARWQCB

Figure 9- Distribution of Total Animal Units per Dairy

Source: CDFA

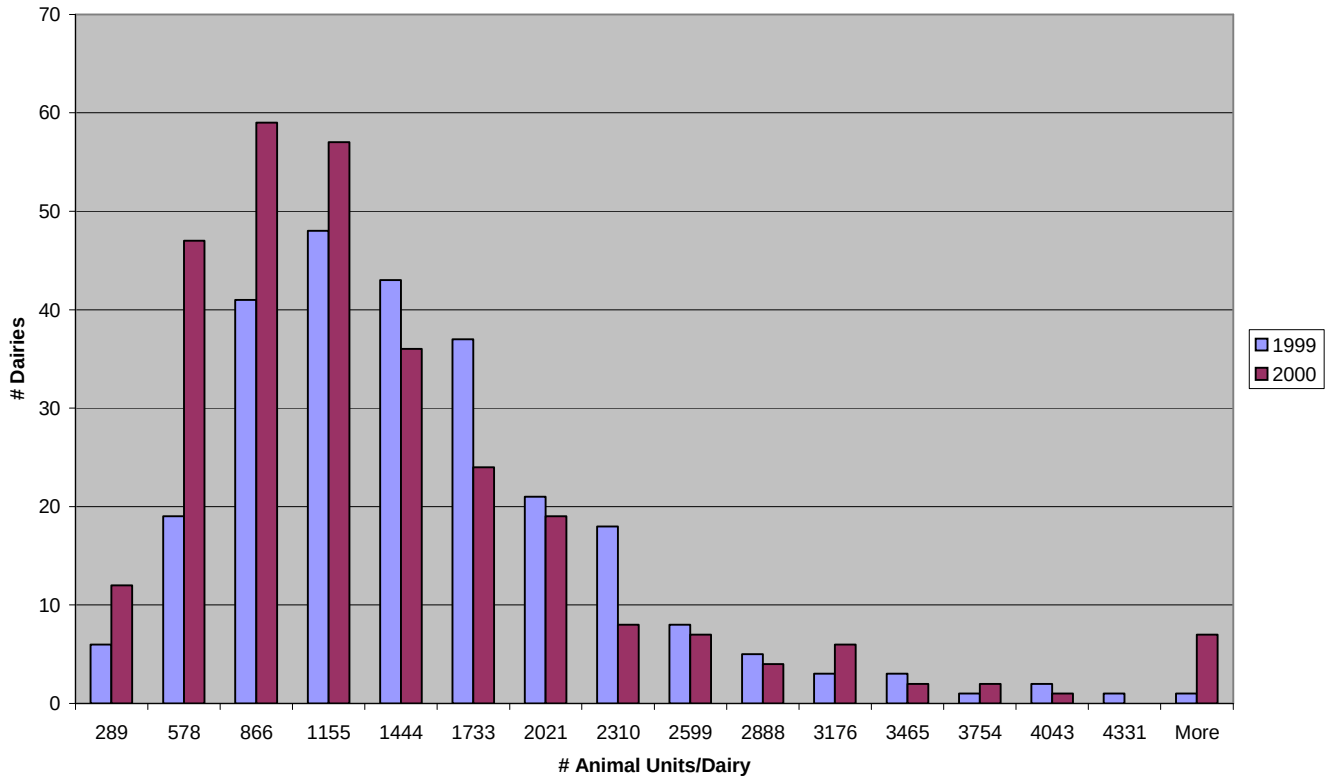


Figure 10- Average Number Cows/Dairy 1995-2000 in the San Bernardino & Riverside County Area

Source: CDFA

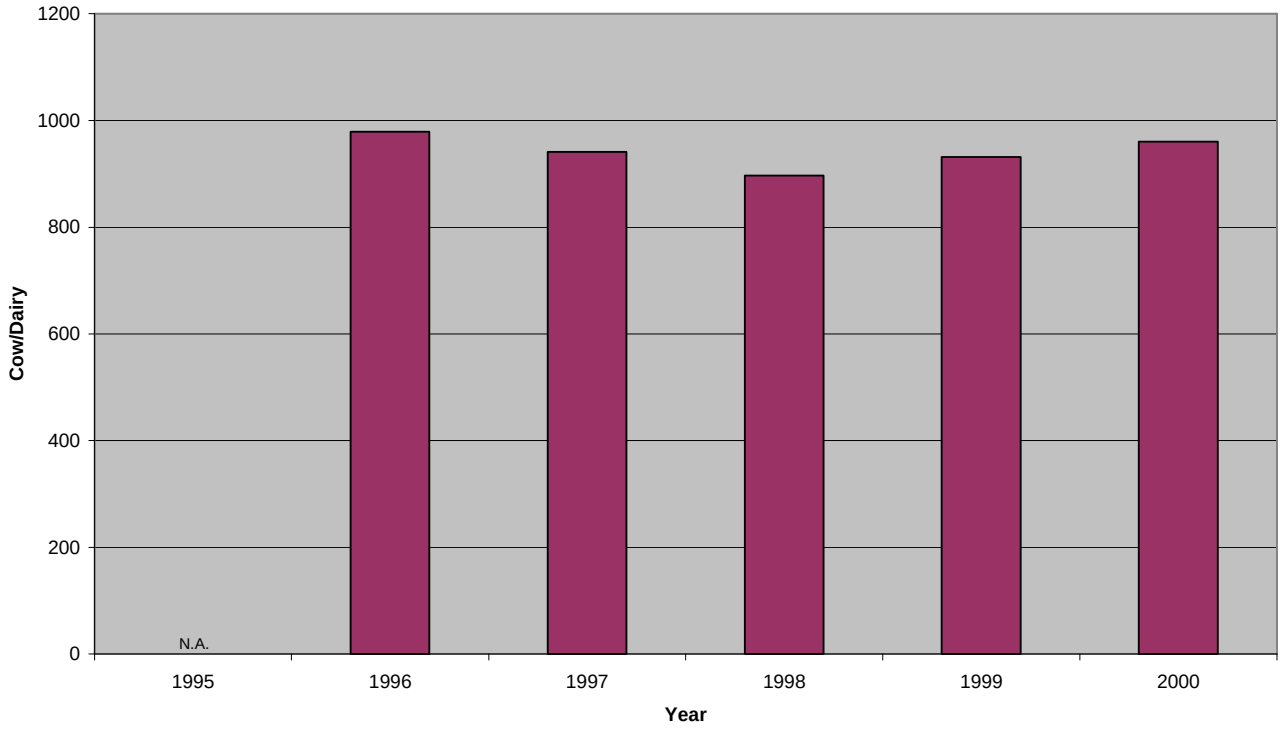
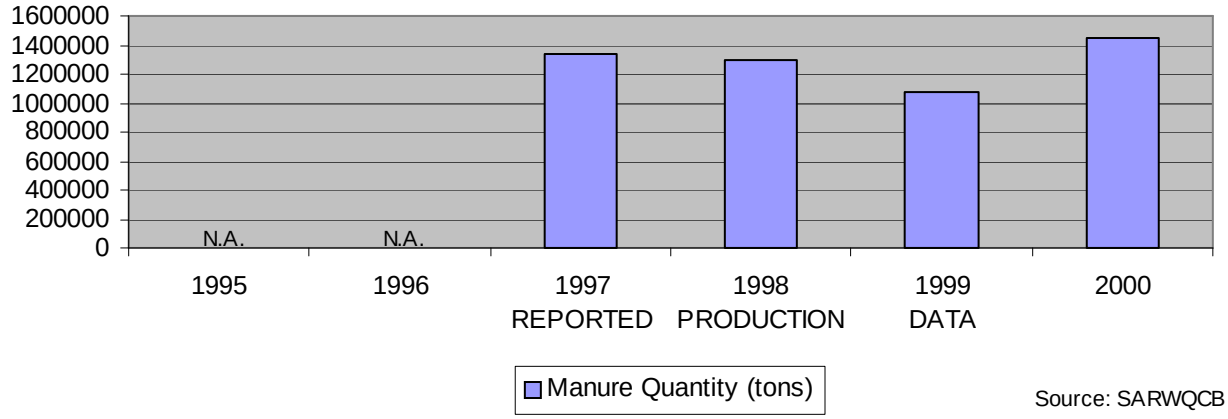
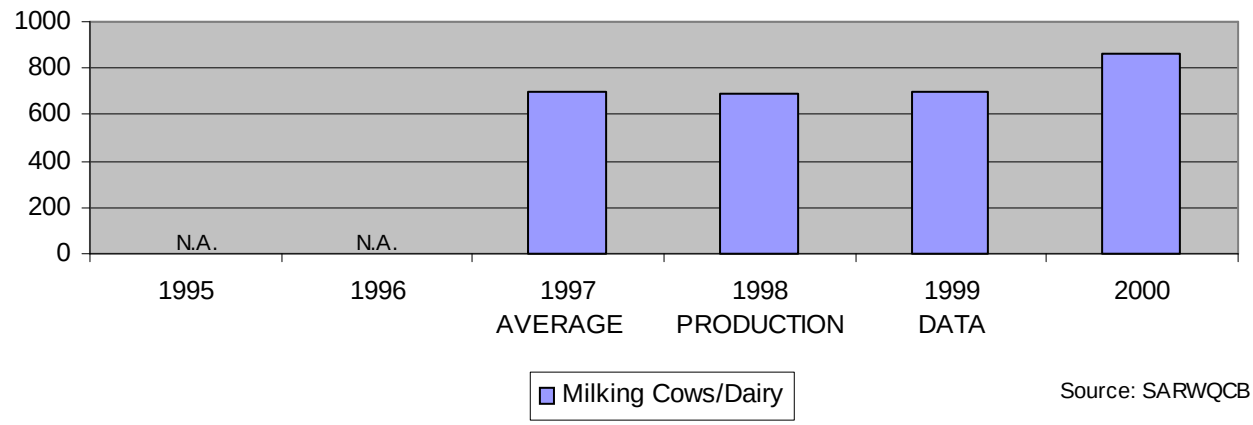


Figure 11- Total Manure Quantity (corral dry tons)



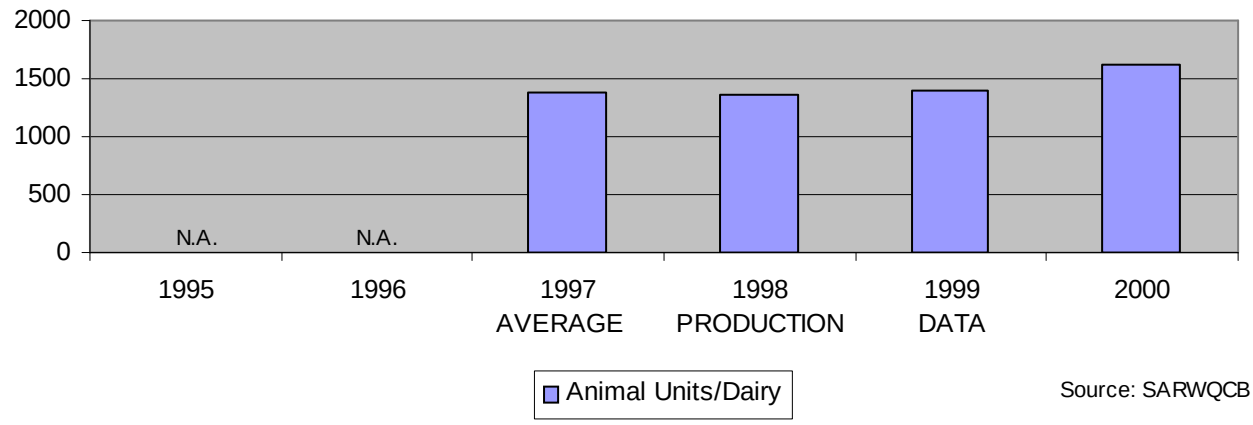
Source: SARWQCB

Figure 12- Average Number Milking Cows Per Dairy



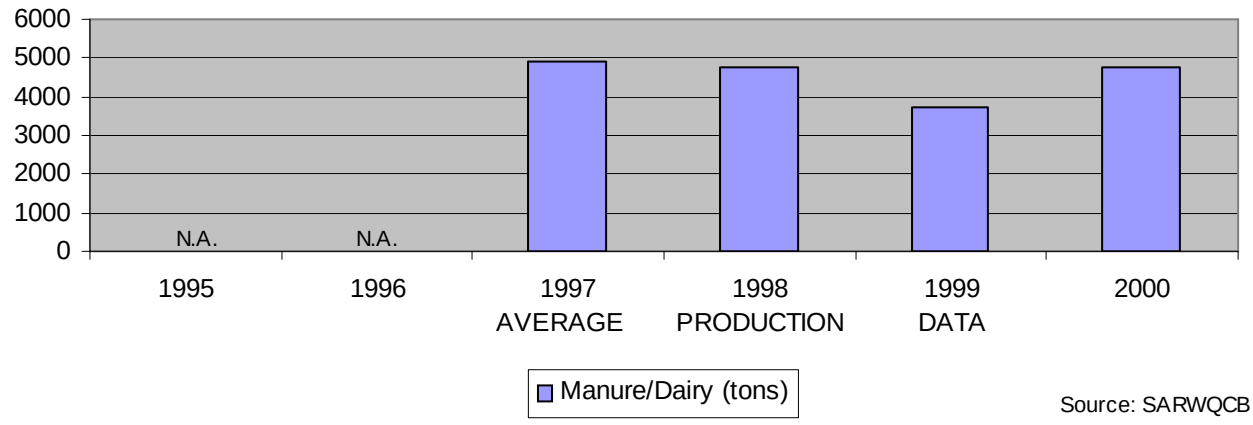
Source: SARWQCB

Figure 13- Average Animal Units Per Dairy



Source: SARWQCB

Figure 14- Average Manure Production Per Dairy



Source: SARWQCB

C. APPENDICES

Appendix 1- SARWQCB Manure Management Regulatory Orders

Appendix 2- USDA- NRCS Conservation Practice Standards

APPENDIX 1 – SARWQCB MANURE MANAGEMENT REGULATORY ORDERS

APPENDIX 2– USDA– NRCS CONSERVATION PRACTICE STANDARDS