The Society for engineering in agricultural, food, and biological systems

Paper Number: 024218
An ASAE Meeting Presentation

Air Pollution Regulatory Process (APRP) and Agricultural Operations

Calvin B. Parnell, Jr. Ph.D., P. E., Regents Professor

Department of Biological and Agricultural Engineering
Texas A&M University, College Station, TX

Sarah E. Parnell-Molloy PE

Former Permit Engineer Texas Natural Resource Conservation Commission

Written for presentation at the
2002 ASAE Annual International Meeting / CIGR XVth World Congress
Sponsored by ASAE and CIGR
Hyatt Regency Chicago
Chicago, Illinois, USA
July 28-July 31, 2002

Abstract: The air pollution regulatory process (APRP) is relatively well defined. Pollutant emissions from sources are measured or approximated and if these pollutants have an impact on the public, steps are taken by State Air Pollution Regulatory Agencies (SAPRAs) to reduce public impacts. Agricultural operations are not immune from SAPRA regulations. Permitting of agricultural operations define the allowable emission rates. Emission factors and dispersion modeling are used to estimate public impacts. Research results are needed to assist agricultural operations with economic and effective compliance with the APRP. It is the contention of the authors that a working knowledge of the APRP is essential for all air pollution engineering research.

Keywords. Emission factors, abatement systems, dispersion modeling, permitting, air pollution, agricultural operations, odors, criteria pollutants, hazardous air pollutants (HAPS)

Introduction:

It is the premise of this paper that knowledge of the Air Pollution Regulatory Process (APRP) is essential for any directed research having an impact on the regulation of air pollution from agricultural operations.[1] In the eyes of some, agriculture has been subjected to inappropriate enforcement actions as a result of air pollution emissions[2] data that either did not exist or were not based on sound science and were incorrect. The reasons why air quality research should be conducted by scientists and engineers with working knowledge of the APRP are as follows:

- Very little quality data on emissions of pollutants from agricultural operations exist. Hence, results of any research on emissions of agricultural pollutants will have an immediate impact. *The reporting of results in a format that may be less likely to be misinterpreted by regulatory personnel will be important.*

- The demand for research results on agricultural emissions and the lack of quality information far exceeds the funding available. Hence, research plans that do not meet the most immediate need as a result of the APRP may be viewed as a waste of resources by both industry and regulatory agencies. *A working knowledge of the APRP will allow for prioritization of research.*

- All research whose results may impact public exposure to air pollutants should have as a priority, protection of public health and welfare irrespective of the source of the pollutants. It is assumed that research quantifying agricultural emissions that demonstrate compliance with rules and regulations meet this objective. *As an example, an emission rate of PM_{10} that is demonstrated to comply with the National Ambient Air Quality Standard at the property line, meets the health effects criterion.*

- **There are some who advocate that 'zero' emissions as the only acceptable level of emissions of air pollutants irrespective of the source.** The simplest and most efficient way to achieve a 'zero' emission goal would be to shut down all sources not able to reduce their emissions of air pollutants to zero. This strategy is unacceptable for the economic welfare of the community, especially for agricultural operations. *An understanding of the APRP allows the researcher to address the agricultural "emissions" from emitting sources with the knowledge that most sources are allowed to emit air pollutants at an "allowable emission rate" (AER) which is defined in the permit.*

- The Clean Air Act (CAA)[3] and corresponding State Clean Air Acts provide the enabling legislations to regulate air pollution.[4] In general, the federal government prescribes rules and the state government prescribes regulations. The states apply and administer both the rules and regulations. "In the past three decades. The Clean Air Act has evolved from a set of principles to guide states in controlling sources of air pollution (the 1967 Air Quality Act) to multiple levels of detailed control requirements…" (Sullivan, 1999). *An understanding of the detailed control requirements for agricultural operations will provide the justification of short-term and long-term research goals and objectives.*

- The 1990 CAA amendments added a new "Operating Permit Program" that mandated fees be collected from all Title V or Part 70 sources. It was conceived that these fees paid by "major sources"[5]

---

[1] The term "agricultural operations" are all operations that are associated with farming and production agriculture. This would include tilling of the soil, planting, and harvesting of crops (field operations); grain elevators; feed mills; cotton gins; oil mills; concentrated animal feeding operations (CAFO); agricultural burning; and emissions from off-road engines.

[2] The term "emissions" can be somewhat misleading. It can represent (1) the emission rate of a pollutant, (2) emissions inventory, (3) emission factor, and (4) emission concentration.

[3] The CAA is a composite of a number of laws and amendments passed by Congress including the following: The Clean Air Act (1963), Motor Vehicle Air Pollution Control Act (1965), Air Quality Act (1967), CAA Amendments (1970,1977, and 1990).

[4] See Appendix A.

[5] See Appendix A.

would fund the regulation of air pollution in the various states. *If agricultural emission factors are incorrect, it is possible that many agricultural sources will be included in the Title V operating permit program when they should not be.*

Research Needs/ Air Quality Problems/Agriculture

Research funding is to a large extent a response to an expressed public need for science and engineering data and solutions for problems. In the case of air pollution regulation of agricultural operations, the problems are as follows:

- Many agricultural operations are being regulated without the necessary "science based" data and/or procedures for appropriate regulation. The primary pollutants of concern for agricultural operations are $PM_{2.5}$, PM_{10}, TSP, odor, H_2S[6], ROG[7], NO_x, and NH_3[8]. The needed data and procedures for appropriate regulation include the following:
  - Accurate emission factors;
  - Dispersion modeling procedures resulting in accurate estimates of downwind concentrations;
  - Efficient and economical air pollution abatement equipment and/or management practices (BACT and BMP) and associated pollutant emission rates;
  - Concentration measurement methods and procedures;
  - Protocols for determining accurate emission rates and/or fluxes from concentration measurements associated with low-level point sources and ground-level area sources;
  - Accurate emissions inventories.
- Agricultural operations are being required to respond to air pollution regulatory actions by installing expensive air pollution controls that do not necessarily benefit the public but may result in many small agribusinesses shutting down;
- The air pollution regulatory pressures on agricultural operations are in response to time-lines that were established by the Clean Air Act and in most cases the regulatory agencies have no choice but to approximate non-existing emissions data for regulatory purposes because of EPA and/or statutory mandates;
- A desire by the agricultural industry to not be required to obtain a "permit to operate" sometimes referred to as the "permit to farm".

In 1996, Congress found that much of the published data on air pollution emissions from agricultural operations were not based upon sound science and directed USDA to establish a task force to address air quality issues. The Agricultural Air Quality Task Force (AAQTF) was initially formed and appointed by the Secretary of Agriculture Dan Glickman under the Federal Advisory Committee Act (FACA) to advise and recommend to the Secretary the research needed to address problems associated with regulation of air pollutants emitted by agricultural operations. This task force has served under FACA rules for three two-year periods. One of the results from the initial two years was a recommendation that $40 million per year for 5 years be allocated for air quality research to address serious problems being faced by agriculture. The second AAQTF (1998-2000)

---

[6] Hydrogen sulfide is not included in the list of air pollutants in the CAA as either a Criteria Pollutant or HAPS. It is, however, listed in the New Source Performance Standards (NSPS). Hence it is a regulated air pollutant. (See Appendix A.)

[7] Reactive organic gasses (ROG) are those reactive volatile organic compounds (RVOC's) that can serve as precursors for the formation of ozone.

[8] Ammonia is not listed as a Criteria Pollutant or HAPS but it is a precursor for the formation of secondary $PM_{2.5}$)

recommended that $65 million per year for 5 years be allocated to this problem. This level of funding has not been realized to-date but funding for air Quality research has increased since the initial AAQTF.

Agricultural Operations and the APRP

It is important that all engineers conducting air pollution research have an understanding of the air pollution regulatory process (APRP). The engineering[9] approach to problems of compliance with rules and regulations of the respective state air pollution regulatory agencies (SAPRA) will be the design and implementation of the **least-costly** air pollution abatement system that will achieve compliance. An alternative (non-engineering) approach would be to design an abatement system that reduces emissions to a minimum without regard to cost of compliance, rules and regulations, or standards. It is through knowledge of the APRP that the appropriate mitigation techniques, Best Management Practices (BMP), or Best Available Control Technologies (BACT) can be developed and/or designed for specific agricultural operations.

One goal of the APRP is to protect the public.[10] Protecting public health includes predicting the level of pollutant by utilizing a computer model, measurement of public exposure to air pollutants, compare the level of exposure to a standard or rule, and limit emissions of sources that result in public exposure that is in excess of the standard or rule. In contrast to Industrial Air Hygiene (IAH), where standards are based upon healthy workers exposed to concentrations for 8-hours per day, 40-hours per week; community air pollution standards are based upon impacts of a public that include infants and elderly persons exposed to concentrations of pollutants 24-hours per day, 365-days per year. Hence, National Ambient Air Quality Standards (NAAQS) are much lower than the threshold limit values (TLV) associated with IAH. For example, the TLV for inert particulate matter is 15 milligrams per cubic meter (mg/m^3) whereas the NAAQS for PM10 is 150 micrograms per cubic meter ($\mu g/m^3$).[11]

A second goal of the APRP is enforcement of the nuisance standard.[12] In simple terms, the APRP includes a right for property owners living near a source of dust or odors to expect the SAPRA to enforce reductions of emissions of a source causing a nuisance to a level whereby they may enjoy their property. Hence, not all air pollution regulations are associated with health effects.

The APRP:

The APRP has a federal, state and local level of regulatory action. On the federal level are the Federal Clean Air Acts and associate amendments. The Environmental Protection Agency (EPA) serves as the national air pollution regulatory agency. In Texas, the Texas Natural Resource Conservation Commission (TNRCC) serves as the state regulatory agency and depending on the size of the metropolitan area (i.e., Houston) may also have a local agency. In California and Arizona, local air districts regulate air pollution.[13]

The APRP includes the following:

- Enabling legislation – Nationally, the enabling legislation to regulate air pollution is the Clean Air Act (CAA, 1963) and its associated amendments. The last amendments of the CAA passed by Congress

---

[9] Engineering is the application of science (mathematics, biology, physics, and chemistry) to solve problems for the benefit of the public. The knowledge of science used by engineers is gained by study, experience, and practice. Engineering problem solving usually involves design. Engineering design is a process that incorporates science that is applied, with judgment and with a goal of utilizing, economically, the materials and forces of nature.

[10] Definitions are included in appendix A to assist the reader of this paper. See health effects standard in Appendix A.

[11] There is a relationship between the Health Effects Screening Levels (HESL) and TLV. In general, an HESL is obtained from the TLV by dividing by 100 or 1000. If the TLV were based upon human exposure, the HESL would be TLV/100; animal exposure, TLV/1000. There is some thought that the NAAQS for PM_{10} was obtained by dividing the TLV for inert dust by 100.

[12] See Appendix A.

[13] In this paper, the term SAPRA will include both state and local air pollution regulatory agencies.

was in 1990. The CAA is the enabling legislation for EPA. States will also have enabling legislation passed by their respective legislatures. In general, this statutory or legal authority is the basis for regulating air polluting sources within the states.

- EPA performs the following functions:
    - Interpret the intent of Congress;
    - Formulate rules and regulations (40CFR Part 50, 51, 53, 55, 60, 61, 63, 70, and 71);
    - Delegate authority to states for the "operating permit" (Title V) program (40CFR Part 70, and 71);
    - Provide over-site of the respective state air pollution regulation processes;
    - Define NSPS, NESHAP, MACT and NAAQS (40CFR Part 50, 51, 53, 60, 61, and 63;
    - Designate non-attainment areas[14]; and
    - Approve State Implementation Plans (SIPs)[15].
- States regulate the emission rates of air pollutants through their respective State Air Pollution Regulatory Agencies[16]. SAPRAs perform the following functions:
    - Formulate rules and regulations (No state rule and regulation can be less restrictive than the EPA rule and regulation.)
    - Prepare and submit State Implementation Plans[17] (SIP) that insures that insures that "emissions from sources within its borders are maintained at a level consistent with the NAAQS." (Sullivan,1999) The SIP addresses the following topics[18]:
        - Enforceable emissions limitations,
        - Air quality data,
        - Enforcement,
        - Interstate air pollution,
        - Adequate personnel, funding and authority,
        - Monitoring and emissions data,
        - Contingency plans,
        - Revisions to the SIP,
        - Part D requirements,
        - Preconstruction review and notification requirements,
        - Air Quality modeling,
        - Permit fees,
        - Local Consultation
    - Permit facilities – There are two separate state permitting programs. One is the preconstruction permit and the second is the Title V (Operating Permit).
        - Preconstruction permit – This permit was necessary to meet the requirements in the SIP. In order to construct a new feed mill, cotton gin, etc., one must obtain a preconstruction air permit prior to construction. This is for all sources including minor sources of air pollution. This permit will typically include a description of all of the air pollution abatement systems and a determination of the allowable emission rate (AER).
        - Operating permit – Title V of the 1990 CAA amendments required that states develop a comprehensive operating program for most sources of air pollution. In reality, only "major sources" are required to have a Title V permit at this time. (40CFR Part 70 and 71) Most agricultural sources are minor sources.
    - Enforcement (SIP, Preconstruction Permits) – Violations of the permit conditions could result in a suit instituted for injunctive relief of no more than $25,000 for each day of violation and for

[14] CAA § 172

[15] CAA § 107and § 110

[16] CAA §107

[17] CAA § 107 and 110

[18] CAA § 110(a)(2)

each act of violation or an administrative penalty of not more than $10,000 per day for each violation.

- Many of the agricultural operations are regulated based upon the nuisance standard and complaint driven. Example[19]: A SAPRA receives a complaint from a citizen suggesting that an AFO is the source of a pollutant that is resulting in the owner of the property unreasonably interfering with the enjoyment of his or her property. (Violation of the nuisance standard.) If the complaint is verified by SAPRA compliance personnel as a valid complaint, the facility is issued a "notice of violation" (NOV) and is subject to a penalty or fine for violation of the respective state air pollution clean air act. The response to the NOV is generally a requirement that the pollution rate be reduced. The facility may have violated their permit conditions emitting more than their AER. If this is the case, the facility must comply with permit conditions and is subject to administrative penalties. If it is determined that they were emitting at a rate equal to or less than their AER, the AER is reduced with implementation of more efficient and costly controls. The facility's permit is changed to reflect the new limitations on the AER and the revised air pollution abatement system.
- Enforcement (Title V/Major sources) – The 1990 CAA amendments provided the authorization for the EPA administrator to bring administrative enforcement actions against violators without going through the Department of Justice. Administrative penalties can be as much as $200,000. In addition, *field citations* for minor violations were authorized issuing environmental "traffic tickets" with fines of up to $5,000 per day per violation.[20] Congress also authorized EPA to pay a bounty of up to $10,000 to anyone who provides information leading to either criminal conviction or civil penalty.[21] The CAA allowed for the imposition of criminal penalties on any person who knowingly violates the law.[22] The penalties are severe and can include up to 5 years in jail.
- Monitoring – Each SAPRA must monitor ambient concentrations of criteria pollutants and respond to State Implementation Plans (SIP) reporting requirements. As areas are designated "non-attainment" (by EPA), the state must include in the SIP the actions that they will take to bring non-attainment areas into attainment.

The problem that agriculture is facing is to respond to increasing pressures from their respective SAPRA to reduce pollutant emissions as a consequence of real or perceived violations of state or federal rules and regulations. The lack of science-based emission factors from agricultural operations impacts the regulatory process in several ways.

1. The SAPRA permitting process is designed to protect the public by insuring that the pollutant concentrations downwind from agricultural sources do not violate the health effects standard. This can be accomplished with dispersion modeling given an emission rate. However, the emission rate is determined from the emission factor. If the emission factor does not exist or is incorrect, the permitting process is flawed.
2. Emission factors are used to develop emission inventories, i.e. the mass of pollutants emitted by different sources per year. If problems exist that require the SAPRA to respond in the SIP such as how to bring a non-attainment area into attainment, the emissions inventories may be used to develop strategies. These strategies usually involve reductions of emission rates of all sources of that pollutant. If, however, the emission factor is incorrect, it is possible that the strategy outlined in the SIP may not work.

[19] The examples used in this section are based primarily on the APRP used in Texas. Other states may operate differently.

[20] CAA § 113(d)(3)

[21] CAA § 113(f)

[22] CAA § 113(c)

References:

Clean Air Act (CAA). U.S. Code. 2002 (Last updated April 2002). U. S. C. 42:§§ 7401-7671p. http://www.epa.gov/oav/caa618.txt.

Cooper, C. David and F. C. Alley. 2002. Air Pollution Control: A Design Approach. Third Edition. Prospect Heights, Illinois: Waveland Press, Inc.

Davis W. T. (Editor). 2000. Air Pollution Engineering Manual (Second Edition). John Wiley and Sons, New York.

40CFR Part 50. 1999. Code of Federal Regulations Title 40, Part 50. National Primary and Secondary Ambient Air Quality Standards. USEPA, Washington, DC.

40CFR Part 51 Subpart I. 1999. Code of Federal Regulations Title 40, Part 51.160. Legally enforceable procedures. USEPA, Washington, DC.

40CFR Part 51 (Appendix W). 1999. Code of Federal Regulations Title 40, Part 51 - Appendix W. Guideline on Air Quality Models. USEPA, Washington, DC.

40CFR Part 53. 1999. Code of Federal Regulations Title 40, Part 53. Ambient Air Monitoring Reference and Equivalent Methods. USEPA, Washington, DC.

40CFR Part 60. 2002. Code of Federal Regulations Title 40, Part 60.Standards of Performance for New Stationary Sources. USEPA, Washington, DC.

40CFR Parts 55 and 71. 1995. Code of Federal Regulations Title 40, Part 55 and 71.Federal Operating Permits Program (Proposed Rule). USEPA, Washington, DC.

40CFR Part 70. 1999. Code of Federal Regulations Title 40, Part 70. State Operating Permit Program. USEPA, Washington, DC.

40CFR Part 71. 1996. Code of Federal Regulations Title 40, Part 71. Federal Operating Permit Program. USEPA, Washington, DC.

Sullivan, T. F. P. (editor). 1999. Environmental Law Handbook (Fifteenth Edition) – Chapter5 - Clean Air Act (Edited by F. W. Brownell). Government Institutes; Rockville Maryland.

U.S. Code. 1991. Clean Air Act (CAA). U. S. C. 42:§§ 7401-7671p. http://www.epa.gov/oav/caa618.txt

USEPA.1985. Compilation of Air Pollutant Emission Factors (Fourth Edition). Office of Air and Radiation and Office of Mobile Sources. Research Triangle Park, NC

USEPA. 1993. Guidance to States on “Potential to Emit”, Fugitive Emissions, and Permit Fees from agricultural Operations – Letter from John Seitz to Charles Fryxell dated October 8, 1993.

USEPA.1998a. Emission Factor Documentation for AP-42. Office of Air Quality and Standards. Research Triangle Park, NC

USEPA. 1998b. National Air Quality Emissions Trends Procedures Document, Sections 1, 4, and 6 1985-1996 Projections 1999-2010. Office of Air Quality Planning and Standards. Research Triangle Park, NC

USEPA. 2001. Air Quality Criteria for Particulate Matter EPA 600/P-99/002bB March 2001 second External Review Draft. National Center for Environmental Assessment; Research Triangle Park, NC

APPENDIX A

DEFINITIONS

The following definitions are needed in order to address the problems that are being faced by agricultural operations relative to a lack of science-based data for the appropriate regulation of the emission rate of air pollutants from this industry:

- Air Pollution – the presence in the outdoor atmosphere of any one or more substances or pollutants in quantities which are or may be harmful or injurious to human health or welfare, animal or plant life, or unreasonably interfere with the enjoyment of life or property, including outdoor recreation (Cooper and Alley, 2002). The regulation of air pollution is accomplished in many states using both the nuisance and health effects standards.
    - Health Effects Standard - the presence in the outdoor atmosphere of any one or more substances or pollutants in quantities which are or may be harmful or injurious to human health or welfare, animal or plant life.
    - Nuisance Standard - the presence in the outdoor atmosphere of any one or more substances or pollutants in quantities that unreasonably interfere with the enjoyment of life or property, including outdoor recreation.
- Air Pollutants – There are 6 criteria pollutants [nitrogen dioxide (NO_x), sulfur dioxide (SO_2), Ozone, particulate matter less than 10 micrometers AED (PM_{10}), carbon monoxide (CO), particulate lead] and 188 hazardous pollutants defined by the CAA.
- Annual Fee – the fee levied on major sources will be a minimum of $25 per-annual-ton-of-emissions for every ton of pollution emitted.
- Best Available Controls – the term “best available controls” means the degree of emissions reduction that the Administrator determines, on the basis of technological and economic feasibility, health, environment, and energy impacts, is achievable through the application of the most effective equipment, measures, processes, methods, systems or techniques, including chemical reformulation, product or feedstock substitution, repackaging, and directions for use, consumption, storage, or disposal [Sullivan, T. F. P. (editor), 1999].
- Emission Factors – EPA published AP-42 emission factors for point sources and fugitive emissions (USEPA, 1985; 1998).
- Fugitive Emissions – those emissions that could not reasonably pass through a stack, chimney, vent or other functionally-equivalent opening (40 CFR part 70, 1999). Examples of fugitive emissions include open transport and storage of materials, vehicular traffic, heavy construction activities, open-lot dairies and feedyards and agricultural tilling.
- Point Source Emissions – those emissions that are collected and passed through a defined point to the environment (40 CFR Part 51, USEPA, 1998a and 1998b).
- Grandfather Clause – this applies to businesses operating in 1972 that have not made any major changes in emissions in the interim. These facilities have, until recently, not been required to obtain a permit. Fees for a “grandfathered” facility are determined annually based on actual emissions from the previous year.
- National Ambient Air Quality Standards (NAAQS) – a maximum concentration that has been established for pollutants in the ambient environment (40CFR Part 50, 1999)
- Potential to emit – the maximum capacity of a stationary source to emit a pollutant under its physical and operational design (USEPA, 1993; 40CFR Parts 55 and 71. 1995). Total annual emissions are calculated using an operating time of 365 days-per-year and 24 hours-per-day or 8760 hours-per-year.
- RACT -- Reasonable Available Control Technology

- BACT – Best Available Control Technology
- LAER – Lowest Achievable Emission Rate
- MACT – Maximum Achievable Control Technology
- Federal Operating Permits (FOP) - Title V (40CFR Part 70, 1999; and 40CFR Part 71, 1996)
- Major Source - There are three procedures where an operation can be classified as a "major source".[23] (Currently only major sources are required to have a FOP (40CFR Part 70, 1999; and 40CFR Part 71, 1996.)

    1. If the facility emits or has the potential to emit 100 tons per year of a regulated pollutant, more than 10 tons per year of a HAPS or a combined 25 tons per year of all emissions of HAPS.
    2. If the facility is subject to National Emission Standards for Hazardous Air Pollutants (NESHAPS).
    3. If the source is subject to New Source Performance Standards (NSPS). Examples of facilities subject to NSPS are Terminal grain elevators with storage capacity more than 2.5 million bushels; any non-terminal grain elevator with storage capacity of 1.0 million bushels of grain; agricultural sources – emissions of a regulated pollutant or potential to emit 100 tons per year.

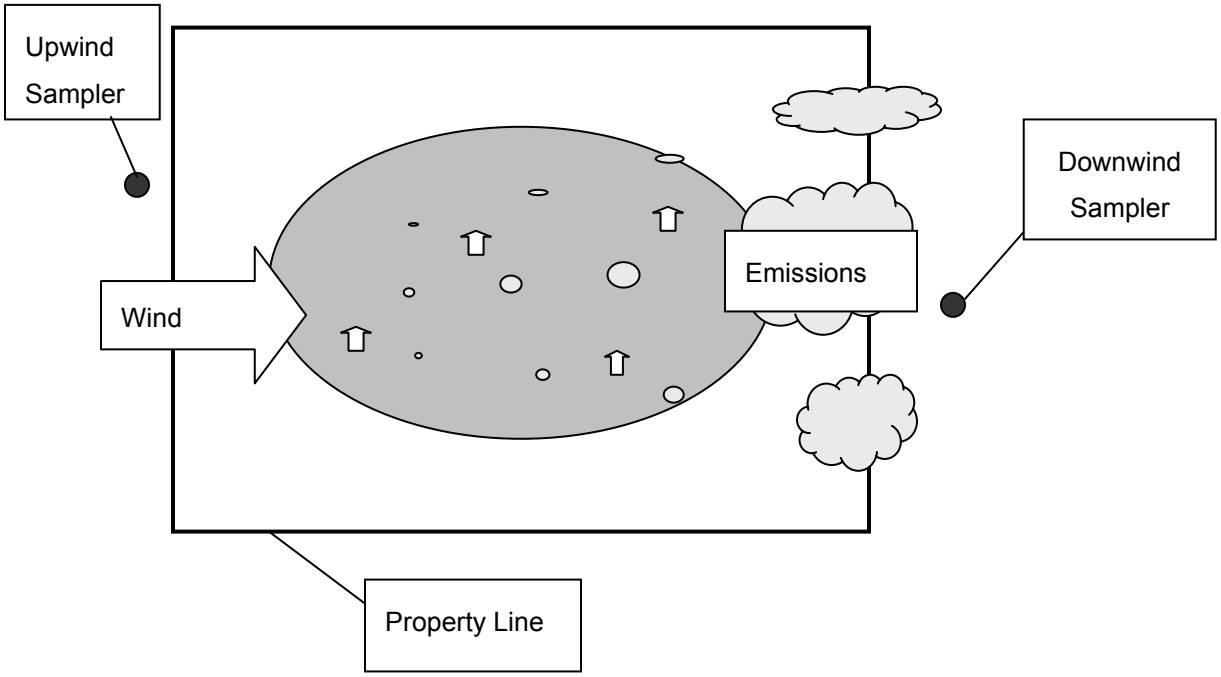

Figure 1. Schematic diagram illustrating the essential elements associated with the regulation of emissions from agricultural sources that can be characterized as ground-level area sources (GLAS) such as dairies, cattle feed yards, field operations, and agricultural burning. The emission rate for a GLAS will be a flux (mass per unit area per unit time). The APRP could include measurements of concentrations using TSP, PM_{10}, and $PM_{2.5}$ samplers upwind and downwind from the source. The APRP addresses off-property impacts of the public.

[23] These example procedures only apply to areas that are in attainment. Nonattainment areas have lower major source thresholds. For extreme ozone nonattainment areas, the threshold for a major source classification is merely emissions of 10 tons per year of reactive VOC's or NO_x.

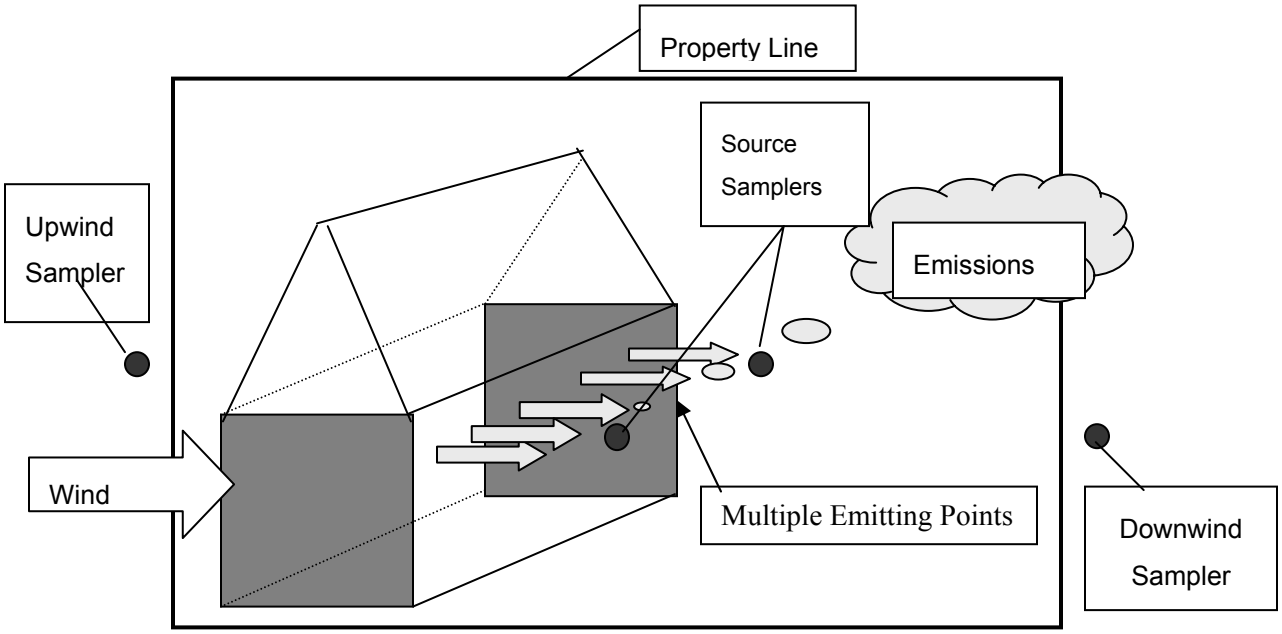

Figure 2. Schematic diagram illustrating the essential elements associated with the regulation of emissions from agricultural sources that can be characterized as low-level point sources (LLPS) such as cotton gins, feed mills, grain elevators, and oil mills. The emission rate for a LLPS will be in units of mass per unit time. The APRP could include measurements of "ambient" concentrations using TSP, PM_{10}, and $PM_{2.5}$ samplers upwind and downwind from the source and/or source sampling emission rates at the point source emitting points. The APRP addresses off-property impacts of the public.

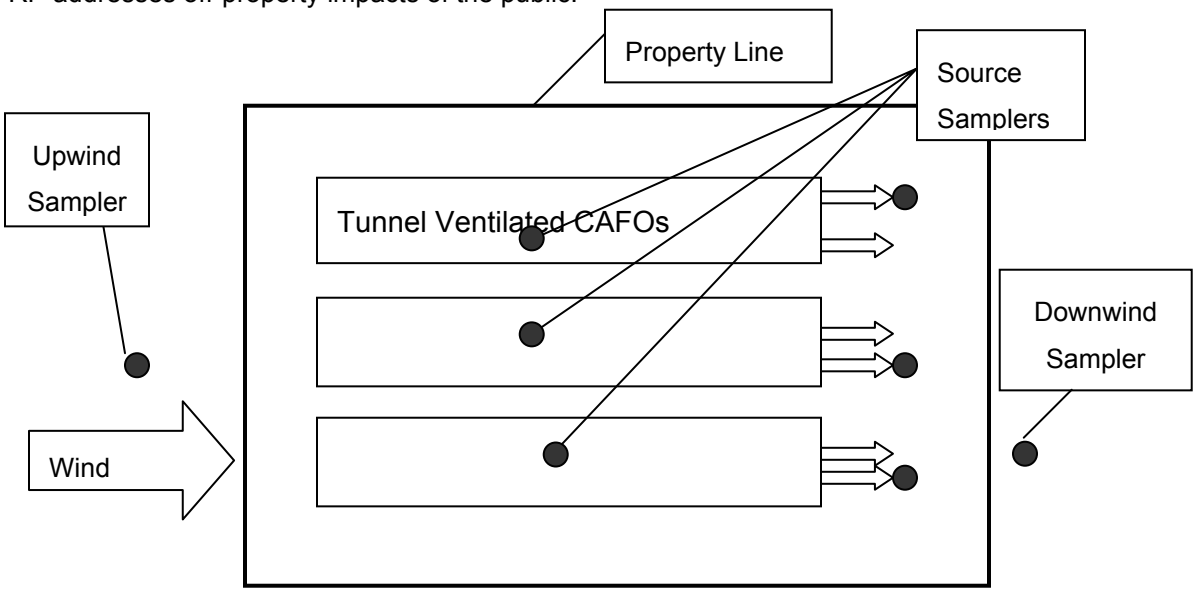

Figure 3. Schematic diagram illustrating the essential elements associated with the regulation of emissions from agricultural sources that can be characterized as low-level point sources (LLPS) such as tunnel ventilated Concentrated Animal Feeding Operations (CAFOs) to include poultry and swine. The emission rate for a LLPS will be in units of mass per unit time. The APRP could include measurements of "ambient" concentrations using TSP, PM_{10}, and $PM_{2.5}$ samplers upwind and downwind from the source off-property. Emission measurements could also include source sampling emission rates at the point source emitting points or inside the house using the assumption that the concentrations of pollutants emitted are equal to the measured concentrations of the indoor environment. The APRP addresses off-property impacts of the public.