SECTION 7.6

CATTLE FEEDLOT DUST

(Updated March 1989)

EMISSION INVENTORY SOURCE CATEGORY
Miscellaneous Processes / Farming Operations

EMISSION INVENTORY CODES (CES CODES) AND DESCRIPTION
620-616-5400-0000 (47340) Cattle Feedlot Dust

METHODS AND SOURCES

This category includes the fugitive dust emissions from beef cattle feedlots. A beef cattle feedlot is an area where beef cattle are confined for four to five months for fattening before marketing. Most feedlot dust is created by cattle movement in the holding pens. Vehicular traffic also creates dust in alleyways.

The activity level for this category is based on beef cattle feedlot throughput. Beef cattle feedlot throughput is defined as the number of beef cattle that have been confined in feedlots for four to five months for fattening before marketing.

The California Livestock Statistics report[1] includes the yearly number of beef cattle marketed (feedlot throughput) in California and the monthly number of cattle in feedlots for each of the four regions in the State. The latter (shown in Table I) represents only the number of beef cattle confined in feedlots and not the feedlot throughput (defined as beef cattle that were confined and then marketed). Actual data on individual feedlot throughput are not available.

The statewide feedlot throughput is disaggregated to each region based on the proportion of the annual average number of beef cattle confined in feedlots in each region. The regions' annual average is estimated by summing the monthly average number of beef cattle confined in feedlots for each region for the 12-month period reported in the California Livestock Statistics report.

To estimate the feedlot throughput for each county in a region, the calculated feedlot throughput for that region is disaggregated by the estimated proportion of beef cattle confined in feedlots in each county obtained from the County Livestock Farm Advisor.[2] Table II lists the counties that are covered by each region.[3] For the year 1987, based on the information from the Farm Advisor, there are several counties that do not have beef cattle feedlot operations and

therefore no dust emissions from the cattle feedlot category. For the counties that have beef cattle feedlot operations, the Farm Advisor provided the rough estimates of the number of beef cattle confined in feedlots in each county based on the approximate sizes of the feedlots. Individual feedlot throughput information is confidential and is not released by the feedlot owners.

The emission factors used in estimating fugitive dust emissions from cattle feedlots are:

PM = 27 tons/1000 head throughput

PM_{10} = 17.2 tons/1000 head throughput [(0.21 PM_{10} /0.33 PM) x (27 tons PM/1000 head throughput)].

These factors are from AP-42[4] and represent the values during a dry season at a feedlot where dust control measures are not employed regularly.

ASSUMPTIONS

1. Both the PM and PM_{10} emission factors are applicable to this inventory year.

2. The total number of beef cattle marketed from each county is proportional to the total number of heads of beef cattle confined in feedlots in each county.

3. There are no dust control measures used by the feedlot operators.

COMMENTS AND RECOMMENDATIONS

A direct head count of the number of beef cattle confined in and marketed from each feedlot coupled with the information on the location of each feedlot will be a more accurate method of estimating emissions than the disaggregation of the statewide number.

The PM emission factor is used for feedlots that do not have any dust control measures. Some feedlots have installed sprinklers for watering as a dust control measure. Dust caused by vehicular traffic in alleyways can be reduced by paving or applying sand oils. Information on these conditions in each feedlot and the development of emission factors to reflect these conditions will greatly improve the emission estimates in this category.

CHANGES IN METHODOLOGY

For the 1983 inventory, the regional beef cattle feedlot population was disaggregated to each county based on the proportion of total beef cattle population in each county. The limitation to this method is that there are some counties which have beef cattle but no beef cattle feedlot operations.

For the 1987 inventory, the method is improved by disaggregating the beef cattle confined in feedlots and then marketed in each region only to the counties that have beef cattle feedlot operations.

The emission factor used for the 1987 emission estimates is based on feedlot throughputs whereas in 1983, the emission factor was based on feedlot capacity. This change in the use of emission factors is based on the fact that the activity data reflect feedlot throughput rather than feedlot capacity. An emission factor specific to PM_{10} emissions has been recently developed by EPA[5] and is used in the 1987 inventory of PM_{10} emissions from this source category.

DIFFERENCES BETWEEN 1983 AND 1987 EMISSION ESTIMATES

The 1987 PM statewide emission estimates are lower than the 1983 emission estimates. The differences are due to the use of a different emission factor which reflects the feedlot throughput rather than the feedlot capacity.

TEMPORAL DISTRIBUTION

The emissions are assumed to be uniform on an annual and weekly basis. This may be invalid because the fattening period for each herd of cattle lasts only four to five months. Actual data should be used if they are available. Daily activity would probably be higher during daylight hours.

SAMPLE CALCULATIONS

Use Merced County as an example (Merced County is one of the seven counties that comprise Region 2 (Table II)):

Total beef cattle marketed from feedlots (feedlot throughput) in CA for the year 1987[1]
= 765,000

Average number of beef cattle confined in feedlots in Region 2 in 1987 (from Table I)
= 132,825

Estimated number of beef cattle marketed (throughput) from the feedlots in Region 2
= (total beef cattle marketed from feedlots in CA)
x (average number of head of beef cattle confined in feedlots in Region 2
/average number of head of beef cattle confined in feedlots in all 4 regions.)

= 765,000 x (132,825/402,087)

= 252,710

Estimated number of beef cattle marketed (throughput) from the feedlots in Merced

= (calculated feedlot throughput in Region 2)

x (county's estimated number of beef cattle confined in feedlots in Merced /estimated number of beef cattle confined in feedlots in Region 2 (data for Merced county and San Joaquin Valley Region are provided by the Farm Advisors[3])).

= 252,710 x (46,000/339,000)

= 34,291

PM emissions from beef cattle feedlot operations

= (34,291 head throughput/year) x (27 tons PM/1,000 head throughput)

= 925.9 tons/year

PM_{10} emissions from beef cattle feedlot operations

= (34,291 head throughput/year) x (17.2 tons PM_{10} /1,000 head throughput)

= 589.2 tons/year

TABLE I

NUMBER OF BEEF CATTLE IN FEEDLOTS, BY DISTRICT, BY MONTH

NUMBER OF HEAD

Month and Year	Sacramento Vly, and Central, North Coast (Region 1)	San Joaquin Vly, Less Kern Co. (Region 2)	So. Calif., Kern, Less Imperial Valley (Region 3)	Imperial Valley (Region 4)
1987				
Jan. 1	6,100	120,100	37,300	231,500
Feb. 1	6,000	102,300	33,100	218,600
Mar. 1	4,700	82,700	2,200	215,400
Apr. 1	4,800	73,000	31,200	206,000
May 1	4,600	84,000	32,200	209,200
Jun. 1	6,500	102,500	33,000	208,000
Jul. 1	7,200	166,300	34,200	207,300
Aug.1	6,700	166,300	33,000	219,000
Sep.1	6,000	171,200	29,800	248,000
Oct.1	7,900	179,300	31,000	256,800
Nov.1	8,800	185,300	30,000	270,900
Dec. 1	10,000	160,900	33,000	271,100
Average	6,612	132,825	32,500	230,150

TABLE II

COUNTIES COVERED BY EACH REGION

Sacramento Valley, Central & North Coast	San Joaquin Valley,Less Kern County	So. Calif., Kern, Less Imperial Vly	Imperial Valley
Alameda	Fresno	Kern	Imperial
Alpine	Kings	Los Angeles	
Amador	Madera	Orange	
Butte	Merced	Riverside	
Calaveras	San Joaquin	San Bernardino	
Colusa	Stanislaus	San Diego	
Contra Costa	Tulare	San Luis Obispo	
Del Norte		Santa Barbara	
El Dorado		Ventura	
Glenn			
Humboldt			
Inyo			
Lake			
Lassen			
Marin			
Mariposa			
Mendocino			
Modoc			
Mono			
Monterey			
Napa			
Nevada			
Placer			
Plumas			
Sacramento			
San Benito			
San Francisco			
San Mateo			
Santa Clara			
Santa Cruz			
Shasta			
Sierra			
Siskiyou			
Solano			
Sonoma			
Sutter			
Tehama			
Trinity			
Tuolumne			
Yolo			
Yuba			

REFERENCES

1. California Department of Food and Agriculture, California Agricultural Statistics : California Livestock Statistics, (1987).

2. Cooperative Extension, University of California, Davis, County Livestock Farm Advisors, personal communications.

3. Neil Gum, California Department of Food and Agriculture, Livestock Statistics Section.

4. U. S. Environmental Protection Agency, Compilation of Air Pollutant Emission Factors, AP-42, Table 6.15-1.

5. U. S. Environmental Protection Agency: Gap Filling PM10 Emission Factors For Selected Open Area Dust Sources. (February 1988).

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Table III
1987 Area Source Emissions
Activity: Agricultural Livestock
Process: Farming Operations
Entrainment: Dust
Dimn: Cattle Feedlot
CES: 47340
Process Rate Unit: Head of Cattle Capacity

AB	County	Process Rate	TOG Emis. (Tons / Year)	CO Emis. (Tons / Year)	NOX Emis. (Tons / Year)	SOX Emis. (Tons / Year)	PM Emis. (Tons / Year)
NC	HUMBOLDT	214	0.00	0.00	0.00	0.00	5.80
NCC	MONTEREY	536	0.00	0.00	0.00	0.00	14.50
	SAN BENITO	214	0.00	0.00	0.00	0.00	5.80
NEP	LASSEN	1221	0.00	0.00	0.00	0.00	33.00
	SISKIYOU	428	0.00	0.00	0.00	0.00	11.60
SC	LOS ANGELES	1431	0.00	0.00	0.00	0.00	1781.20
	RIVERSIDE	1431	0.00	0.00	0.00	0.00	7832.90
	SAN BERNARDINO	1218	0.00	0.00	0.00	0.00	8745.40
SCC	SANTA BARBARA	3708	0.00	0.00	0.00	0.00	100.10
	VENTURA	106	0.00	0.00	0.00	0.00	2.90
SED	IMPERIAL	437877	0.00	0.00	0.00	0.00	11822.70
	LOS ANGELES	1	0.00	0.00	0.00	0.00	40.50
	RIVERSIDE	2	0.00	0.00	0.00	0.00	121.50
	SAN BERNARDINO	7200	0.00	0.00	0.00	0.00	371.00
SJV	FRESNO	184128	0.00	0.00	0.00	0.00	4971.50
	KERN	52985	0.00	0.00	0.00	0.00	1430.60
	KINGS	3728	0.00	0.00	0.00	0.00	100.70
	MADERA	3728	0.00	0.00	0.00	0.00	100.70
	MERCED	34291	0.00	0.00	0.00	0.00	925.90
	SAN JOAQUIN	6709	0.00	0.00	0.00	0.00	181.10
	STANISLAUS	6709	0.00	0.00	0.00	0.00	181.10
	TULARE	13418	0.00	0.00	0.00	0.00	362.30
SV	SACRAMENTO	8037	0.00	0.00	0.00	0.00	217.00
	YUBA	1929	0.00	0.00	0.00	0.00	52.10
TOTAL		771249	0.00	0.00	0.00	0.00	39411.90

Fraction of Reactive Organic Gases (FROG): .7500
(Reactive Organic Gases (ROG) Emissions = TOG X FROG)
Fraction of PM10 (FRPM10): .4800
(PM10 Emissions = PM X FRPM10)