that CNMP needs would be 90 percent for recordkeeping activities.

Overall, annual recordkeeping costs totaled $30 million. The annual average cost was $117 per farm (table 33). Recordkeeping costs were highest for swine farms, averaging $224 per farm. Costs were lowest for poultry farms ($90 per farm), small farms with confined livestock types ($54 per farm), farms with pastured livestock types ($54 per farm), and specialty livestock farms ($54 per farm).

Table 33 Annual average recordkeeping costs per farm, by livestock type and farm size

Dominant livestock type or farm	Number of farms	Recordkeeping costs
Fattened cattle	10,159	142
Milk cows	79,318	160
Swine	32,955	224
Turkeys	3,213	90
Broilers	16,251	90
Layers/pullets	5,326	136
Confined heifers/veal	4,011	117
Small farms with confined livestock types	42,565	54
Pastured livestock types	61,272	54
Specialty livestock types	2,131	54
Large	19,746	168
Medium	39,437	150
Small	198,018	106
All CNMP farms	257,201	117

CNMP development costs

A significant part of the cost of CNMPs is the cost of developing the CNMP for each livestock operation. CNMP development includes

- working with farmers to define objectives, develop and evaluate alternatives, and finalize a plan;
- designing the conservation practices identified in the CNMP plan;
- assisting with and inspecting the installation of the conservation practices and identified management activities; and
- following up with the producer to address questions and to assure that the practices are being carried out as intended.

Because of the technical complexities that must be addressed in developing and implementing a CNMP, most producers need assistance from technical specialists to ensure that sustainable systems will be installed and operated, and that those systems meet the objectives of a CNMP and are consistent with the production goals of the farmer. This assistance could be provided by technical specialists from either the public or private sectors.

Alternatives development and evaluation involves meeting with the livestock operator to determine resource concerns related to the operation, obtain pertinent operational data (such as the number of animals and plans for expansion), and identify present practices for handling manure. Resource concerns include potential environmental risks, such as runoff from feedlots, proximity to streams and lakes, and eroding cropland. Based on this information the planner would develop several alternatives the operation could use to meet CNMP criteria. The preparation of the alternatives would involve developing preliminary designs for structural practices, estimating the acres and cropping practices needed to utilize manure nutrients efficiently, and determining the conservation system needed to control erosion on acres receiving manure. The planner would then meet with the operator again to review alternatives and assist with the selection. A CNMP would then be prepared.

Once a CNMP has been planned and an alternative selected by the operator, it is necessary to **design** the structures that need to be installed or practices that need to be implemented. For structures this involves taking soil borings in areas where ponds and lagoons will be built, performing a detailed survey (with surveyor instruments) of all production areas including areas proposed for structure locations, and surveys for land treatment practices. Design would also involve plotting of the surveys, making the necessary structure design calculations, and drafting the final design that will be used to guide construction, including the necessary construction specifications to support the drawings. For nutrient management it would involve developing the nutrient balance calculations and specification of a nutrient management plan.

Implementation involves the assistance needed to ensure that the installation of practices and structures meet the designs and specifications developed. It generally involves providing layout stakes for a contractor to follow, performing necessary material tests onsite (soil compaction tests, for example), performing periodic spot surveys to ensure constructed practices are being installed according to designs, and performing a final checkout survey after the practice is installed. It would also involve working with the operator to calibrate manure-spreading equipment.

After a practice or a plan has been installed, it is necessary to **follow up** by returning to the operation to ensure the practice is working properly and to make changes or adjustments to the CNMP if needed.

CNMP development costs were estimated in terms of technical assistance hours needed to accomplish the four primary functions defined above. Separate estimates were made for land treatment practices, nutrient management, and manure and wastewater handling and storage. Technical assistance associated with recordkeeping is embedded in the estimates for these three elements, and could not be estimated separately.

The technical assistance generally associated with the **land treatment practices element** can involve a range of technical disciplines from engineering to soil conservation. Practices used to satisfy the criteria established for this element are management practices (residue management, stripcropping) and structural practices (terraces, divisions, sediment basins). Assistance would typically be provided by soil conservationists, agronomists, nutrient management specialists, rangeland specialists, and engineers.

Technical assistance for the **manure and wastewater handling and storage element** is primarily engineering. The majority of the time accounted for under this element involves the design and installation assistance associated with waste handling, storage, and treatment structural practices. Many of the practices covered under this element require a licensed engineer's involvement by State Law. However, some of the resource assessment and preliminary design calculations associated with the volume of waste generated, proportion of nutrients in manure, and locating clean water diversions can be performed by soil conservationists, agronomists, or nutrient management specialists.

Technical assistance for the **nutrient management element** is generally associated with technical disciplines trained in crop management activities. Typically, this element of a CNMP would be addressed by a nutrient management specialist or agronomist. However, because of the close interaction between nutrient management and soil erosion, it is anticipated that many soil conservationists would also fill this role.

Estimates of technical assistance hours do **not** include administrative time associated with carrying out various additional functions that usually take place as part of the overall implementation process, such as making Federal, State, Tribal, or local incentive program eligibility determinations, assisting operators with the completion of State, Tribal, and local permit applications, and various agency performance reporting and documentation activities.

Estimates of CNMP development costs also do **not** include the time spent by the operator working with the technical specialists to produce the plan. Depending on the complexity of the operation and the availability of records, the economic value of time spent by the operator could be significant.

Estimating the costs of developing CNMPs

Estimates of technical assistance hours were based on the Fiscal Year 2001 National NRCS/Partnership Workload Analysis (2001 WLA). In fiscal year 2001, the NRCS conducted a workload analysis of the technical assistance time associated with assisting producers to plan and implement various conservation systems and practices. The purpose of the 2001 WLA was to analyze the conservation workload of NRCS and its conservation partners using 44 Core Work Products (CWPs) to define field activities. These 44 CWPs capture a broad range of activities from systems planning to various administrative and program support functions. Each CWP activity is further defined by specific tasks associated with its completion. From 5 to 10 tasks define a CWP. The 2001 WLA database was developed by 218 Regional Time Teams (RTTs) consisting of NRCS and technical staff from partner organizations familiar with that region's specific conservation operations.

At the time the 2001 WLA was conducted, the technical requirements associated with a CNMP had not yet been defined. Therefore, the 2001 WLA did not contain a specific CWP that addressed CNMPs. However, by combining time estimates from 15 of the relevant CWPs and selecting specific tasks that would be included in development of a CNMP, an estimate was made of technical assistance hours associated with CNMP development. A list of the 15 CWPs and specific tasks that were used to estimate CNMP technical assistance hours for each of the three CNMP elements is presented in table 34. Technical assistance hours were estimated for each of the four primary functions —alternatives development, design, implementation, and followup—by assigning the various tasks to each function.

Table 34 Core work products (CWPs) and specific tasks associated with CNMP elements

CWP number	CWP Title	CNMP Element	Specific tasks*
01a	Conservation Systems on Cropland (Planning)	Land Treatment Practices	Recognize problems, determine land user needs, resource assessment, resource evaluation, evaluate data, develop alternatives, formulate decisions, travel time, followup.
01b	Conservation Systems on Cropland (Application)	Land Treatment Practices	Prepare designs, provide maintenance information, solicit necessary reviews, travel time, layout practices, check out practices, certify practices.
02a	Conservation Systems on Rangeland (Planning)	Land Treatment Practices	Recognize problems, determine land user needs, resource assessment, resource evaluation, evaluate data, develop alternatives, formulate decisions, travel time, followup.
02b	Conservation Systems on Rangeland (Application)	Land Treatment Practices	Prepare designs, provide maintenance information, solicit necessary reviews, travel time, layout practices, check out practices, certify practices.
03a	Conservation Systems on Pastureland (Planning)	Land Treatment Practices	Recognize problems, determine land user needs, resource assessment, resource evaluation, evaluate data, develop alternatives, formulate decisions, travel time, followup.
03b	Conservation Systems on Pastureland (Application)	Land Treatment Practices	Prepare designs, provide maintenance information, solicit necessary reviews, travel time, layout practices, check out practices, certify practices.

See footnote at end of table.

Table 34 Core work products (CWPs) and specific tasks associated with CNMP elements—Continued

CWP number	CWP Title	CNMP Element	Specific tasks*
04a	Conservation Systems on Forest Land (Planning)	Land Treatment Practices	Recognize problems, determine land user needs, resource assessment, resource evaluation, evaluate data, develop alternatives, formulate decisions, travel time, followup.
04b	Conservation Systems on Forest Land (Application)	Land Treatment Practices	Prepare designs, provide maintenance information, solicit necessary reviews, travel time, layout practices, check out practices, certify practices.
06a	Irrigation Systems	Land Treatment Practices	Design survey, prepare designs, provide maintenance information, travel time, lay out practices, check out practices, certify practices.
06b	Irrigation Water Management	Nutrient Management	Evaluate soil, plant, water relationship/needs, efficiency determination, develop water management plan, provide maintenance information, travel time, followup.
07a	Dry Waste Management Systems (collection, storage, and/or treatment)	Manure and Wastewater Handling and Storage	Resource assessment, travel time, prepare designs, provide maintenance information, layout practices, check out practices, certify practices.
07b	Dry Waste Management Systems (waste application)	Nutrient Management	Resource assessment, develop waste utilization, plan, travel time, run waste utilization program, soils information and testing, followup.
08a	Wet Waste Management Systems (collection, storage, and/or treatment)	Manure and Wastewater Handling and Storage	Resource assessment, travel time, prepare designs, provide maintenance information, layout practices, check out practices, certify practices
08b	Wet Waste Management Systems (waste application)	Nutrient Management	Resource assessment, develop waste utilization, plan, travel time, run waste utilization program, soils information and testing, followup.
25	State & Local Reviews,	Land Treatment Practices Inspections & Permits	Meet with Applicant/Other, Receive/Process Application, Review Plan and Calculations, Conduct Inspections, Develop Recommendations, Review Revisions, Issue Permit

* To estimate technical assistance hours for design, the following specific tasks were used: prepare designs, provide maintenance information, solicit necessary reviews, travel time, design survey, and run waste utilization program. To estimate technical assistance for implementation, the following specific tasks were used: layout practices, checkout practices, certify practices, soil information and testing. To estimate technical assistance for followup, the following specific tasks were used: followup activities and issue report. The remaining tasks listed above were used to estimate technical assistance hours for alternatives development.

Adjustments were made to account for specific CNMP-related tasks that had not been incorporated into the original CWP estimates. Adjustments to the 2001 WLA data were based on a subset of 20 RTTs in regions with significant livestock production. Each of the 20 representative RTTs evaluated the original data in the 2001 WLA for the 15 CWPs associated with a CNMP by comparing the original assumptions to the new technical requirements for CNMP development and implementation. The adjustments developed by each ranged from zero (no change) to an increase of 400 percent; the average adjustment was 17 percent.

For the land treatment practices element, technical assistance hours were based on the incremental change calculated using the adjustment factors. The total time estimate in the 2001 WLA database would overstate the hours needed specifically to develop a CNMP. For example, consider CWP-01, Conservation Systems on Cropland (Planning). Under existing USDA programs, most cropland already has some kind of plan to address soil erosion criteria. By using the incremental change the estimation would capture only the time associated with adjusting the existing plan where needed to address the higher standards established by the CNMP. The total time associated with land treatment for each of the technical assistance functions is the sum of the incremental changes for all the CWPs used to define this element.

Two CWPs were used to define the manure and wastewater storage and handling element, CWP–07a and CWP–08a. The difference between the two is that one is representative of animal feeding operations that manage their manure primarily as a solid (dry), and the other is representative of operations that primarily manage their manure as a liquid (wet). The total time used for estimation of this element was the base time established in the 2001 WLA plus the incremental change. The base time identified in the 2001 WLA for these CWPs was included in the time accounting because, unlike the CWPs for land treatment, these CWPs are dedicated to animal feeding operations. The incremental change that is applied to these CWPs reflects the comparison of the new CNMP requirements and new conservation practice standards to the waste management system criteria that existed at the time the 2001 WLA was conducted.

The technical assistance time used for the nutrient management element was based on three CWPs: CWP–06b Irrigation Water Management, CWP–07b Dry Waste Management Systems (waste application), and CWP–08b Wet Waste Management Systems (waste application). Only the incremental change associated with CWP–06b was included. It was assumed that for irrigation water management to apply, an irrigation system would already be in place. If an irrigation system was in place, some form of irrigation water management was already in use. For CWP–07b and CWP–08b, the estimation used the sum of the 2001 WLA base time plus the incremental change because these CWPs were dedicated to animal feeding operations in the 2001 WLA.

Separate estimates were made for each of the model farms described previously (see tables 2 to 5). (The model farm structure was the same as that used to estimate recoverable manure in appendix B.) The 2001 WLA database provided descriptions of the farms that were used as a basis for the time estimates. The descriptions included the size of the operation, type of manure management system (wet or dry), and dominant livestock type. Because these were not exactly the same as the definitions for model farms, some RTT estimates were assigned to more than one model farm. The number of RTT estimates assigned to a model farm ranged from 1 to 34. The average of the RTT estimates was used to represent technical assistance hours for each model farm. Technical assistance estimates for each model farm are presented in table 35.

An additional adjustment factor was developed to account for mismatches between the size of operations specified in the 2001 WLA database and the model farm size. In some cases the size of the model farm was smaller than most of the RTT estimates assigned to it, so the number of hours needed to be adjusted downward. In other cases the size of the model farm was larger than most of the RTT estimates assigned to it, so the number of hours needed to be adjusted upward. In yet other cases the match was close enough to need only a small, or no, adjustment. Adjustment factors ranged from 0.6 for some small model farms to 1.7 for large model farms. The final estimate of technical assistance hours for each model farm was obtained by multiplying the estimate of hours in table 35 by the size adjustment factor, also presented in table 35.

Table 35 Technical assistance hours per farm as derived from RTT estimates and size adjustment factor for model farms (heading abbreviations: AD=alternatives development, D=design, I=implementation, F=followup)

Model farm regions & livestock type	Model farm size class	Representative farm	Probability (%)	Size adjustment factor	Manure & wastewater handling & storage				- - Land treatment - -				Nutrient management			
					AD	D	I	F	AD	D	I	F	AD	D	I	F
Dairy farms																
North Central & Northeast	35-135	#1: no storage	29	0.8	30.7	72.1	41.6	3.2	21.6	1.3	4.2	1.4	40.9	5.5	9.8	11.5
		#2: solids storage	47	0.8	30.7	72.1	41.6	3.2	21.6	1.3	4.2	1.4	40.9	5.5	9.8	11.5
		#3: liquid storage—deep pit or slurry	7	0.7	45.8	74.7	73.5	9.1	13.1	4.1	2.6	2.4	34.0	4.1	9.3	9.6
		#4: liquid storage—basin, pond, lagoon	17	0.7	44.1	75.4	67.9	8.4	12.2	3.8	2.4	2.2	32.5	4.5	8.9	9.1
	135-270	#1: no storage	15	1.0	21.2	73.0	38.0	3.3	9.8	3.0	2.1	1.5	21.0	4.1	3.2	6.6
		#2: solids storage	28	1.0	21.2	73.0	38.0	3.3	9.8	3.0	2.1	1.5	21.0	4.1	3.2	6.6
		#3: liquid storage—deep pit or slurry	14	1.0	44.0	85.4	63.3	5.1	19.5	3.6	4.1	2.3	41.3	6.1	11.7	10.8
		#4: liquid storage—basin, pond, lagoon	43	1.0	44.0	85.4	63.3	5.1	19.5	3.6	4.1	2.3	41.3	6.1	11.7	10.8
	> 270	#2: solids storage	14	1.3	25.9	65.6	33.5	4.4	10.8	1.4	0.6	1.0	21.9	6.7	4.3	6.9
		#3: liquid storage—deep pit or slurry	18	1.3	44.2	92.2	70.4	6.2	14.6	2.2	2.9	1.5	42.6	5.6	11.9	12.4
		#4: liquid storage—basin, pond, lagoon	68	1.3	42.7	89.9	67.5	6.0	13.9	2.1	2.8	1.4	41.2	5.4	11.4	12.1
Southeast	35-135	#2: solids storage	59	0.9	11.9	12.3	12.1	2.7	2.5	0.9	0.5	0.3	13.8	2.5	3.7	5.0
		#5: any liquid storage	41	0.9	22.0	69.3	32.3	2.5	6.7	1.0	1.8	3.9	19.8	4.0	6.1	4.9
	> 135	#2: solids storage	30	1.4	27.7	30.2	30.1	0.9	3.0	0.5	0.6	0.2	35.1	2.1	4.3	15.3
		#5: any liquid storage	70	1.4	30.0	66.8	52.5	3.1	2.6	0.3	0.7	0.2	28.6	2.7	6.3	8.9
West	35-135	#2: solids storage	50	0.8	23.1	27.5	22.6	1.1	15.2	6.3	4.7	1.6	32.9	5.4	7.5	7.3
		#5: any liquid storage	50	0.8	33.9	64.7	42.2	5.2	17.6	8.4	4.6	2.2	40.0	6.1	9.9	17.4
	135-270	#2: solids storage	11	1.0	17.3	18.8	18.5	1.4	7.2	5.1	4.0	1.1	33.3	4.1	7.6	3.8
		#5: any liquid storage	89	1.0	35.2	63.6	47.9	2.8	28.4	8.3	5.0	3.4	46.5	6.0	10.7	21.8
	> 270	#5: any liquid storage	100	1.2	37.3	64.5	45.2	4.8	15.0	7.3	5.2	2.0	47.1	10.8	11.4	12.4
Fattened cattle farms																
New England	> 35	#1: scrape and stack	100	1.1	27.7	43.9	34.0	3.7	46.9	16.7	10.5	3.2	50.8	4.9	15.2	16.6
PA, NY, NJ	> 35	#1: scrape and stack	100	1.3	50.7	87.2	71.5	8.4	14.7	0.8	1.6	5.2	41.8	5.8	10.4	15.0
Southeast	> 35	#1: scrape and stack	30	1.2	16.1	12.6	17.5	2.1	4.5	0.4	1.0	5.7	17.4	3.8	3.5	3.9
		#2: manure pack, runoff collection	70	1.2	15.3	12.2	15.5	3.2	4.7	0.3	1.2	4.4	17.5	3.3	3.7	4.7
Midwest	35-500	#1: scrape and stack	30	0.8	37.1	47.9	39.3	1.1	9.1	1.6	0.8	0.9	22.8	2.8	4.1	5.0
		#2: manure pack, runoff collection	70	0.8	37.1	47.9	39.3	1.1	9.1	1.6	0.8	0.9	22.8	2.8	4.1	5.0
	> 500	#2: manure pack, runoff collection	100	1.3	33.6	51.4	30.6	2.3	6.5	1.8	0.9	1.0	25.1	2.4	3.4	2.6
Northern Plains	35-500	#2: manure pack, runoff collection	100	1.0	66.3	111.9	51.6	6.0	19.0	9.4	6.4	2.5	22.2	4.7	4.0	3.5
	> 500	#2: manure pack, runoff collection	100	1.1	33.4	96.9	61.0	3.2	23.3	14.7	11.4	3.5	28.3	6.1	7.2	10.2

Table 35 Technical assistance hours per farm as derived from RTT estimates and size adjustment factor for model farms (heading abbreviations: AD=alternatives development, D=design, I=implementation, F=followup)—Continued

Model farm regions & livestock type	Model farm size class	Representative farm	Probability (%)	Size adjustment factor	Manure & wastewater handling & storage				- - Land treatment - -				Nutrient management			
					AD	D	I	F	AD	D	I	F	AD	D	I	F
Central Plains	35-1000	#2: manure pack, runoff collection	100	0.6	17.8	34.0	33.5	6.0	0.0	0.0	0.0	0.0	18.0	5.0	5.5	6.0
	> 1000	#2: manure pack, runoff collection	100	1.0	24.8	45.0	28.7	7.0	15.0	11.6	9.8	2.3	22.3	3.3	9.1	7.6
South Central	35-1000	#2: manure pack, runoff collection	100	0.8	33.9	32.0	32.1	2.3	1.2	0.0	0.3	0.4	58.1	15.1	13.9	9.8
	> 1000	#2: manure pack, runoff collection	100	1.3	35.9	30.9	34.6	1.9	1.4	0.0	0.3	0.4	54.3	12.0	12.8	10.5
West	35-500	#2: manure pack, runoff collection	100	1.0	35.6	76.5	49.7	2.0	33.5	15.1	7.7	4.2	41.7	5.1	8.8	17.7
	> 500	#2: manure pack, runoff collection	100	1.2	22.8	59.0	61.4	0.0	23.3	16.8	13.1	3.1	28.5	9.0	4.0	6.0
Confined heifer farms																
Northeast	> 35	#1: confinement barn/ bedded manure	70	1.2	28.4	36.5	29.2	2.5	59.2	9.9	12.7	3.1	53.1	4.4	17.3	15.3
		#2: open lots with scraped solids	30	1.2	28.4	36.5	29.2	2.5	59.2	9.9	12.7	3.1	53.1	4.4	17.3	15.3
Midwest	> 35	#1: confinement barn/ bedded manure	40	1.0	42.0	47.9	45.3	1.0	10.7	1.0	0.5	1.9	29.9	3.0	5.1	4.7
		#2: open lots with scraped solids	60	1.0	39.0	44.7	41.4	0.8	9.2	0.9	0.5	1.6	28.7	4.3	4.9	5.4
Southeast	> 35	#2: open lots with scraped solids	100	1.2	12.8	10.8	9.8	6.5	5.2	0.2	1.9	0.5	18.1	1.7	4.3	7.1
West	> 35	#2: open lots with scraped solids	100	1.0	27.6	56.7	33.3	3.4	35.9	21.6	20.3	6.6	30.4	4.6	11.3	10.4
Veal Farms																
All states	> 35	#1: confinement house	100	1.1	35.3	58.0	60.0	0.0	17.0	1.0	2.0	3.0	25.3	7.0	6.0	9.3
Broiler Farms																
Northeast	> 35	#1: confinement houses	100	1.2	26.6	33.9	26.3	3.5	11.0	1.9	0.7	1.7	20.2	3.8	5.6	12.1
Southeast	> 35	#1: confinement houses	100	1.1	12.3	13.7	9.6	1.9	2.4	0.6	0.5	0.3	18.7	2.5	4.0	6.4
Northwest	> 35	#1: confinement houses	100	1.1	13.6	27.3	19.3	0.2	4.2	2.7	2.7	1.6	17.9	3.3	5.1	2.7
Southwest	> 35	#1: confinement houses	100	0.8	12.3	13.7	9.6	1.9	2.4	0.6	0.5	0.3	18.7	2.5	4.0	6.4
Layer Farms																
Southeast	35-400	#1: high rise	30	0.9	13.5	22.3	9.7	0.8	3.5	0.4	1.1	0.4	26.0	2.8	3.6	7.0
		#2: shallow pit	27	0.9	13.5	22.3	9.7	0.8	3.5	0.4	1.1	0.4	26.0	2.8	3.6	7.0
		#3: flush with lagoon	43	0.9	12.9	22.2	9.7	0.5	1.8	0.4	0.5	0.2	25.0	2.6	3.3	6.7
	> 400	#1: high rise	52	1.5	15.4	26.1	7.9	0.9	4.3	0.2	1.7	0.4	29.6	3.1	3.6	7.2
		#3: flush with lagoon	48	1.3	14.7	26.6	7.7	0.3	1.6	0.1	0.8	0.2	28.6	2.8	3.1	6.7

Table 35 Technical assistance hours per farm as derived from RTT estimates and size adjustment factor for model farms (heading abbreviations: AD=alternatives development, D=design, I=implementation, F=followup)—Continued

Model farm regions & livestock type	Model farm size class	Representative farm	Probability (%)	Size adjustment factor	Manure & wastewater handling & storage				- - Land treatment - -				Nutrient management			
					AD	D	I	F	AD	D	I	F	AD	D	I	F
West	35-400	#2: shallow pit	49	0.9	24.5	50.2	35.9	3.3	22.2	20.5	14.2	3.8	27.3	4.3	15.0	6.6
		#5: scraper system	51	0.9	24.5	50.2	35.9	3.3	22.2	20.5	14.2	3.8	27.3	4.3	15.0	6.6
	> 400	#1: high rise	18	1.2	19.5	58.0	56.7	0.0	44.6	33.6	26.2	6.3	17.0	8.0	5.0	0.0
		#4: manure belt	14	1.2	19.5	58.0	56.7	0.0	44.6	33.6	26.2	6.3	17.0	8.0	5.0	0.0
		#5: scraper system	68	1.2	19.5	58.0	56.7	0.0	44.6	33.6	26.2	6.3	17.0	8.0	5.0	0.0
South Central	35-400	#2: shallow pit	45	0.9	16.2	14.6	9.2	1.1	1.9	0.6	0.2	0.1	17.5	3.5	5.7	5.7
		#5: scraper system	55	0.9	16.2	14.6	9.2	1.1	1.9	0.6	0.2	0.1	17.5	3.5	5.7	5.7
	> 400	#3: flush with lagoon	100	1.4	25.2	67.2	22.5	0.0	2.0	4.8	1.6	0.0	33.5	11.2	15.3	7.2
North Central, Northeast	35-400	#1: high rise	55	0.9	19.8	28.9	22.7	1.5	7.9	2.3	1.6	2.9	19.0	4.4	4.7	6.1
		#2: shallow pit	25	0.9	19.8	28.9	22.7	1.5	7.9	2.3	1.6	2.9	19.0	4.4	4.7	6.1
		#4: manure belt	20	0.9	19.9	30.3	23.7	1.0	8.3	2.5	1.7	3.0	18.9	4.2	4.5	5.7
	> 400	#1: high rise	81	1.7	18.8	25.1	16.7	1.4	9.9	2.0	0.7	2.9	17.8	4.5	3.7	5.9
		#4: manure belt	19	1.7	22.4	33.9	25.0	1.4	9.8	1.9	0.7	3.2	17.6	4.4	3.6	6.6
Farms with pullets																
North Central, Northeast	> 35	#2: layer-type confinement houses	100	1.1	21.4	30.6	23.5	2.3	8.0	2.5	1.7	2.7	19.0	3.5	5.2	7.7
Southeast	> 35	#2: layer-type confinement houses	100	1.2	12.3	21.4	8.3	0.8	2.9	0.4	0.8	0.3	25.8	2.4	3.2	7.3
West	> 35	#2: layer-type confinement houses	100	1.0	14.6	11.8	14.3	0.2	1.1	1.0	0.5	0.1	19.4	1.9	4.5	4.2
South Central	> 35	#2: layer-type confinement houses	100	1.0	14.6	11.8	14.3	0.2	1.1	1.0	0.5	0.1	19.4	1.9	4.5	4.2
Turkey Farms																
East	> 35	#1: confinement houses	90	1.2	19.9	30.0	9.8	0.8	2.5	0.1	1.1	0.3	15.8	1.6	2.2	4.3
		#2: turkey ranch	10	1.2	19.6	25.7	8.8	2.3	2.1	0.1	0.9	0.2	16.8	2.6	3.1	5.8
South Central	> 35	#1: confinement houses	100	1.0	21.0	52.0	30.0	6.0	11.8	2.0	2.3	1.7	15.3	1.5	4.0	3.4
Western Midwest	> 35	#1: confinement houses	50	1.0	26.0	33.1	28.0	0.0	0.0	0.0	0.0	0.0	36.0	20.0	5.0	4.0
		#2: turkey ranch	50	1.0	26.0	33.1	28.0	0.0	0.0	0.0	0.0	0.0	36.0	20.0	5.0	4.0
Eastern Midwest	> 35	#1: confinement houses	80	1.4	22.0	18.0	11.0	6.0	0.0	0.0	0.0	0.0	11.0	1.0	2.0	4.0
		#2: turkey ranch	20	1.4	22.0	18.0	11.0	6.0	0.0	0.0	0.0	0.0	11.0	1.0	2.0	4.0
West except CA	> 35	#1: confinement houses	90	1.0	16.0	58.0	41.7	0.0	57.1	19.0	31.2	7.0	11.0	4.0	6.0	0.0
		#2: turkey ranch	10	1.0	22.0	18.0	11.0	6.0	0.0	0.0	0.0	0.0	11.0	1.0	2.0	4.0
California	> 35	#1: confinement houses	80	0.9	16.0	58.0	41.7	0.0	57.1	19.0	31.2	7.0	11.0	4.0	6.0	0.0
		#2: turkey ranch	20	0.9	22.0	18.0	11.0	6.0	0.0	0.0	0.0	0.0	11.0	1.0	2.0	4.0
Swine farrowing farms																
Southeast	35-100	#1: total confinement, liquid, lagoon	100	1.2	15.8	28.1	18.4	4.8	4.6	0.7	1.8	0.4	20.6	5.7	5.9	7.1
	> 100	#1: total confinement, liquid, lagoon	100	1.4	16.1	37.5	18.7	4.5	5.1	0.8	1.9	0.6	25.3	4.0	7.4	4.2
Midwest, Northeast	35-500	#1: total confinement, liquid, lagoon	10	0.9	37.8	66.5	50.7	3.0	8.2	2.2	2.4	1.2	34.3	4.8	5.8	8.2
		#2: total confinement, slurry, no lagoon	76	0.9	37.3	68.7	48.9	2.5	7.2	2.0	2.3	1.1	31.8	4.5	5.6	7.7

Table 35 Technical assistance hours per farm as derived from RTT estimates and size adjustment factor for model farms (heading abbreviations: AD=alternatives development, D=design, I=implementation, F=followup)—Continued

Model farm regions & livestock type	Model farm size class	Representative farm	Probability (%)	Size adjustment factor	Manure & wastewater handling & storage				- - Land treatment - -				Nutrient management			
					AD	D	I	F	AD	D	I	F	AD	D	I	F
		#4: building with outside access, solids	14	0.9	38.7	70.1	50.5	2.8	7.5	2.0	2.2	1.1	32.6	4.6	5.7	7.8
	> 500	#1: total confinement, liquid, lagoon	85	1.3	36.2	93.3	54.2	4.3	3.5	3.7	4.7	1.1	26.8	3.3	4.2	7.5
		#2: total confinement, slurry, no lagoon	15	1.3	36.6	96.5	58.0	5.3	4.0	4.3	5.5	1.2	29.0	3.4	4.2	8.2
West	35-500	#1: total confinement, liquid, lagoon	45	0.9	51.2	59.6	48.4	0.8	12.6	5.9	6.4	1.8	29.4	8.0	5.7	9.6
		#2: total confinement, slurry, no lagoon	25	0.9	51.2	59.6	48.4	0.8	12.6	5.9	6.4	1.8	29.4	8.0	5.7	9.6
		#5: pasture or lot	30	0.9	50.2	57.0	48.4	0.0	18.1	7.8	9.3	2.6	34.2	6.0	7.3	8.0
	> 500	#1: total confinement, liquid, lagoon	65	1.2	54.6	119.6	77.5	1.0	32.7	16.8	20.7	4.9	28.9	3.0	2.5	10.0
		#2: total confinement, slurry, no lagoon	35	1.2	54.6	119.6	77.5	1.0	32.7	16.8	20.7	4.9	28.9	3.0	2.5	10.0
Swine grower farms																
Southeast	35-100	#1: total confinement, liquid, lagoon	90	1.2	15.8	28.1	18.4	4.8	4.6	0.7	1.8	0.4	20.6	5.7	5.9	7.1
		#2: total confinement, slurry, no lagoon	10	1.2	14.2	26.1	14.8	4.4	4.6	0.7	1.8	0.4	17.8	5.3	5.5	5.7
	> 100	#1: total confinement, liquid, lagoon	100	1.4	19.3	33.8	26.3	5.0	3.5	0.4	1.3	0.4	31.4	4.8	6.3	8.7
Midwest, Northeast	35-500	#1: total confinement, liquid, lagoon	6	0.9	45.3	76.5	57.1	2.8	8.7	2.0	2.2	1.5	33.7	4.3	6.0	8.5
		#2: total confinement, slurry, no lagoon	53	0.9	45.3	76.5	57.1	2.8	8.7	2.0	2.2	1.5	33.7	4.3	6.0	8.5
		#3: building with outside access, liquid	14	0.9	45.5	78.3	57.5	2.8	8.7	2.0	2.2	1.5	34.0	4.3	6.1	8.4
		#4: building with outside access, solids	27	0.9	43.4	74.8	58.2	3.0	9.4	2.2	2.4	1.6	33.5	4.2	6.1	8.8
	> 500	#1: total confinement, liquid, lagoon	27	1.3	30.1	80.1	43.0	3.9	2.7	2.8	3.6	0.8	23.8	3.0	3.7	6.7
		#2: total confinement, slurry, no lagoon	73	1.3	31.5	83.0	45.8	4.0	2.9	3.0	3.9	0.9	24.7	3.1	3.9	6.7
West	35-500	#1: total confinement, liquid, lagoon	100	0.9	53.2	74.1	54.3	1.0	18.1	7.8	9.3	2.6	31.0	7.5	7.0	9.0
	> 500	#1: total confinement, liquid, lagoon	100	1.2	90.8	163.8	109.9	1.0	50.5	24.6	30.0	7.4	46.1	3.0	3.8	15.0
Swine farrow-to-finish farms																
Southeast	35-100	#1: total confinement, liquid, lagoon	40	1.2	14.5	26.0	16.0	4.0	4.0	0.6	1.6	0.3	19.1	5.4	6.0	6.1
		#2: total confinement, slurry, no lagoon	10	1.2	16.5	21.2	19.0	6.0	5.4	0.2	2.1	0.5	21.2	5.1	4.7	8.0
		#5: pasture or lot	50	0.9	16.9	30.7	21.0	5.4	3.1	0.8	1.3	0.3	20.8	6.1	7.0	7.4

Table 35 Technical assistance hours per farm as derived from RTT estimates and size adjustment factor for model farms (heading abbreviations: AD=alternatives development, D=design, I=implementation, F=followup)—Continued

Model farm regions & livestock type	Model farm size class	Representative farm	Probability (%)	Size adjustment factor	Manure & wastewater handling & storage				- - Land treatment - -				Nutrient management			
					AD	D	I	F	AD	D	I	F	AD	D	I	F
	> 100	#1: total confinement, liquid, lagoon	90	1.4	17.8	36.6	24.1	6.2	4.4	0.5	1.7	0.5	23.1	4.5	5.2	5.4
		#2: total confinement, slurry, no lagoon	10	1.4	17.8	36.6	24.1	6.2	4.4	0.5	1.7	0.5	23.1	4.5	5.2	5.4
Midwest, Northeast	35-500	#1: total confinement, liquid, lagoon	15	0.9	40.8	72.0	52.6	3.0	7.9	3.3	3.1	1.3	27.9	3.6	6.4	7.9
		#2: total confinement, slurry, no lagoon	75	0.9	40.8	72.0	52.6	3.0	7.9	3.3	3.1	1.3	27.9	3.6	6.4	7.9
		#4: building with outside access, solids	10	0.9	40.8	72.0	52.6	3.0	7.9	3.3	3.1	1.3	27.9	3.6	6.4	7.9
	> 500	#1: total confinement, liquid, lagoon	40	1.3	37.7	81.2	54.2	4.1	3.6	2.8	3.7	0.9	30.6	3.9	4.8	7.3
		#2: total confinement, slurry, no lagoon	60	1.3	39.8	84.2	57.9	4.2	3.9	3.1	4.0	1.0	32.1	4.1	5.0	7.4
West	35-500	#1: total confinement, liquid, lagoon	10	0.9	53.2	74.1	54.3	1.0	18.1	7.8	9.3	2.6	31.0	7.5	7.0	9.0
		#2: total confinement, slurry, no lagoon	90	0.9	53.2	74.1	54.3	1.0	18.1	7.8	9.3	2.6	31.0	7.5	7.0	9.0
	> 500	#1: total confinement, liquid, lagoon	10	1.2	90.8	163.8	109.9	1.0	50.5	24.6	30.0	7.4	46.1	3.0	3.8	15.0
		#2: total confinement, slurry, no lagoon	90	1.2	51.6	102.4	71.7	0.0	32.7	16.8	20.7	4.9	32.0	1.5	2.8	9.0
Small farms with confined livestock types	All	none	100	1.0	20.4	48.0	27.7	2.1	14.4	0.9	2.8	0.9	27.2	3.7	6.5	7.7
Farms with pastured livestock types	All	none	100	1.0	16.0	8.0	7.0	2.0	12.0	5.0	3.0	1.0	10.0	3.0	3.0	3.0
Specialty livestock farms	All	none	100	1.0	13.6	27.3	19.3	0.2	4.2	2.7	2.7	1.6	17.9	3.3	5.1	2.7

Estimates of technical assistance hours for each model farm were used to calculate estimates for each CNMP farm in the Census of Agriculture in the same way as cost estimates were calculated for the manure and wastewater handling and storage element and as recoverable manure estimates were calculated in appendix B. For farms with more than one representative farm assigned to it, the probabilities associated with each representative farm were used as weights to obtain a weighted total. The probabilities associated with each model farm are also presented in table 35.

Summary of costs for CNMP development

CNMP development costs, in terms of technical assistance hours, averaged 149 hours per farm (table 36). This breaks down into 57 hours per farm for alternatives development, 46 hours per farm for design, 35 hours per farm for implementation, and 10 hours per farm for followup. For the three CNMP elements, it breaks down into 92 hours per farm for manure and wastewater handling and storage, 18 hours per farm for land treatment, and 39 hours per farm for nutrient management.

Technical assistance hours were highest for dairies, swine farms, and farms with confined heifers and veal, averaging over 190 hours per farm. Broiler farms and

Table 36 CNMP development hours per farm, by livestock type and farm size

Dominant livestock type or farm size class	Number of farms	CNMP elements			Technical assistance functions				Total hours
		Manure & wastewater handling & storage hours	Land treatment hours	Nutrient management hours	Alternative development hours	Design hours	Implementation hours	Followup hours	
Fattened cattle	10,159	101	13	33	54	47	37	9	147
Milk cows	79,318	123	19	50	69	62	47	13	192
Swine	32,955	145	13	43	68	68	53	11	201
Turkeys	3,213	84	11	31	49	43	25	8	126
Broilers	16,251	52	7	37	41	24	19	11	95
Layers/pullets	5,326	55	11	34	42	29	21	8	100
Confined heifers/veal	4,011	116	33	46	79	55	49	12	195
Small farms with confined livestock types	42,565	98	19	45	62	53	37	11	163
Pastured livestock types	61,272	33	21	19	38	16	13	6	73
Specialty livestock types	2,131	60	11	29	36	33	27	5	101
Large	19,746	107	16	47	64	54	40	13	170
Medium	39,437	96	15	40	58	46	36	11	151
Small	198,018	90	18	37	57	45	34	10	146
All CNMP farms	257,201	92	18	39	57	46	35	10	149

farms with pastured livestock types had the lowest number of hours, averaging 95 hours per farm and 73 hours per farm, respectively. The difference by farm size was not pronounced; large farms averaged 170 hours per farm and small farms averaged 146 hours per farm.

Technical assistance hours also varied regionally (table 37). The highest estimate was for farms in the Pacific region, averaging 184 hours per farm. The next highest was the Northeast region with 179 hours per farm, followed by the Lake States with 170 hours per farm. The lowest estimates were for farms in the Delta States (99 hours per farm) and the Southeast region (104 hours per farm).

Overall, technical assistance hours totaled 38.2 million. The Corn Belt region, the Lake States, and the Northeast region accounted for two-thirds of these hours.

To convert these estimates of technical assistance hours into dollar estimates requires a further breakdown of the tasks that need to be performed and the level of technical skills required, which was not done. However, a rough estimate can be made based on a few simple assumptions.

Establishing an hourly cost of technical assistance involves accounting for more than the time involved with performing the task. Support costs also need to be taken into account, such as tools and equipment needed to perform the task (i.e., engineering survey instruments, measuring equipment, vehicles, office space), expertise support costs (training and continuing education, license fees), and employment benefits (leave, retirement, insurance). Estimates of these support costs can range from 20 to 50 percent of salary costs depending on the technical discipline and the specific support needs of that trade. Based on information obtained from private sector sources, the hourly rate charged for technical services can range from $20 to $100 per hour or more, including support costs. The average cost is approximately $60 per hour. Budgets developed by Federal agencies that provide technical services (such as the Natural Resources Conservation Service, U.S. Corp of Engineers, Bureau of Reclamation) show national average hourly rates of about $50,

Table 37 CNMP development hours per farm, by farm production region

Farm production region	Number of farms	CNMP elements			Technical assistance functions				Total hours
		Manure & wastewater handling & storage hours	Land treatment hours	Nutrient management hours	Alternative development hours	Design hours	Implementation hours	Followup	
Appalachian	22,899	69	13	34	47	34	26	10	117
Corn Belt	71,540	98	17	36	58	48	37	9	152
Delta States	12,352	56	11	32	42	27	21	9	99
Lake States	52,817	109	18	42	63	55	41	11	170
Mountain	7,964	87	29	42	63	47	36	12	158
Northeast	31,598	113	20	46	66	57	43	13	179
Northern Plains	26,309	78	17	31	49	38	30	8	125
Pacific	7,974	104	31	54	74	57	44	14	189
Southeast	12,807	59	10	35	44	29	22	9	104
Southern Plains	10,941	74	22	41	57	39	30	11	137
All CNMP farms	257,201	92	18	39	57	46	35	10	149

including support costs. These average cost estimates are very general; hourly rates vary substantially among livestock operations depending on the complexity of the site-specific practices that are needed.

Averaging the two estimates, an hourly rate of $55 was selected to approximate the dollar value of technical assistance hours. Applying the $55 hourly rate to the 38.2 million hours results in an estimate of about $2.1 billion, or about $8,126 per farm for the 257,201 CNMP farms.

Summary of CNMP development and implementation costs

The annual CNMP implementation cost for all four CNMP elements averaged $6,748 per farm for the 257,201 farms that are expected to need a CNMP, and CNMP development costs, in terms of technical assistance hours, averaged 149 hours per farm (table 38). In addition, off-farm land application costs, which are assumed to be borne by the manure-receiving farms in this assessment, averaged $98 per CNMP farm. The

Table 38 CNMP costs per farm, by livestock type and farm size

Dominant livestock type or farm size	Number of farms	Animal units per farm*	Record-keeping costs per farm	Nutrient management costs per farm	Off-farm transport costs per farm	Land treatment costs per farm	Manure & waste-water handling & storage costs per farm	Total CNMP implementation costs per farm				CNMP development costs
								Average	Low**	High**	Per animal unit	
			($/yr)	($/yr)	($/yr)	($/yr)	($/yr)	($/yr)	($/yr)	($/yr)	($/yr)	(hr/farm)
Fattened cattle	10,159	1,298	142	1,655	4,646	2,613	9,112	18,167	1,026	308,005	14	147
Milk cows	79,318	195	160	2,101	1,619	2,660	3,249	9,788	2,362	97,013	50	192
Swine	32,955	276	224	1,601	2,450	3,615	4,139	12,029	2,060	75,159	44	201
Turkeys	3,213	687	90	230	6,169	3,391	7,940	17,820	1,643	122,412	26	126
Broilers	16,251	183	90	248	1,667	1,220	2,351	5,576	1,128	36,187	30	95
Layers/pullets	5,326	297	136	144	7,414	1,685	4,015	13,394	342	95,887	45	100
Confined heifers/ veal	4,011	301	117	1,153	1,410	2,026	3,192	7,898	594	76,660	26	195
Small farms with confined live-stock types	42,565	25	54	203	16	351	199	823	102	4,953	33	163
Pastured live-stock types	61,272	117	54	211	3	357	823	1,448	280	7,757	12	73
Specialty live-stock types	2,131	17	54	180	0	634	843	1,691	1,711	3,256	NA	101
Large farms	19,746	1,419	168	1,526	9,679	3,925	15,167	30,465	2,199	252,014	21	170
Medium farms	39,437	252	150	1,085	2,281	2,897	3,397	9,809	1,210	64,426	39	151
Small farms	198,018	80	106	987	345	1,267	1,070	3,773	161	25,298	47	146
All types	257,201	210	117	1,043	1,358	1,721	2,509	6,748	195	67,429	32	149

* Represents **all** animal units on the farm, but does not include animal units for specialty livestock types, which were not estimated.
** The **low** estimate corresponds to the one-percentile value for the farms in each group, and the **high** estimate corresponds to the 99th-percentile value.